

Coso Monitoring Program
October 1994 Through September 1995

by
S. C. Bjornstad
Public Works Department

JANUARY 1996

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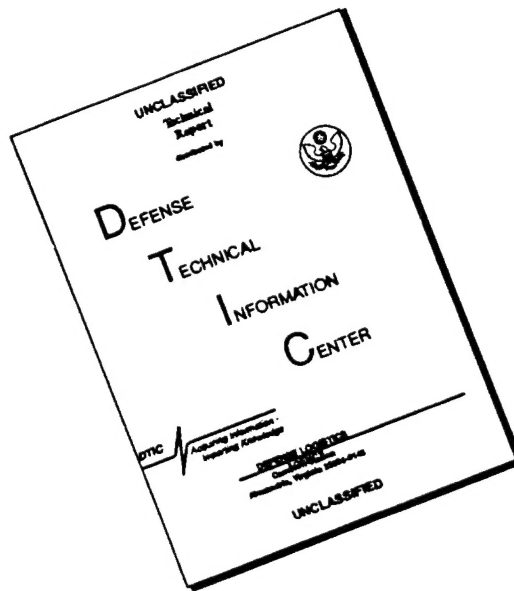
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Naval Air Weapons Station

FOREWORD

This report presents the status of the Coso Monitoring Program conducted for the period October 1994 through September 1995 by the Naval Air Weapons Station (NAWS), China Lake, Calif. The investigation, funded under the NAWS Coso Geothermal Development Program, is being conducted to provide baseline information on hydrology and surface geothermal activity in the Coso Hot Springs area.

This report was reviewed for technical accuracy by Allan M. Katzenstein and Andrew E. Sabin (NAWS 823G00D).

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13. ABSTRACT (Maximum 200 words) <p>(U) The Coso Monitoring Program is a continuing effort in support of the Navy's geothermal resources within the Known Geothermal Resource Area (KGRA). A substantial body of reports exists on this project (14 technical publications). Because the project is essentially the same from year to year, the previously published reports share similarities of text that don't bear repeating again in this period's report. This report concentrates instead on data presentation and interpretation; the reader is referred to the most recent report (NAWS-CL TP 006) for detailed description of the overall project and the individual sites monitored.</p>			
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INTRODUCTION

The Coso Monitoring Program was initiated in 1978 to gather baseline data on the surface and near-surface geothermal activity at Devils Kitchen and Coso Hot Springs located inside the boundaries of the Naval Air Weapons Station (NAWS), China Lake, Calif., the main thermal sites within the Coso Known Geothermal Resource Area (Coso KGRA). This report represents the eighteenth year of continuous data collection.

The format of the report for the current reporting period has been changed from previous years. A substantial body of reports has been established on this project (14 technical publications) and the project is essentially the same from year to year, therefore much of the text of each report reiterates previously published information. This year's report concentrates instead on data presentation and interpretation and the reader is referred to last year's report (Reference 1) for detailed descriptions of the overall project and the individual sites monitored.

Seasonal and diurnal variations of the thermal activity in these hot spring areas continue to be evident. Overall, the level of activity has been very stable during this reporting period, although there appears to be some evidence that the total amount of heat reaching the surface at the margins of the thermal areas is beginning to decline toward historic, pre-1988, monitored values.

The new digital recording equipment reported last year, the ITT Barton Automated Data Scanning System (ADSCAN), has been installed at all steam well sites. These ADSCAN units and a Handar digital weather station have all provided a continuous data record since their installation.

Monitoring sites of the Coso Hot Springs area and type of data collected at each site are presented in Table 1. The location of each site is shown in Figure 1.

TABLE 1. Monitoring Functions and Locations.

Monitored sites	Continuous steam flow	Continuous steam temperature	Wellhead pressure	Periodic water level	Periodic water temperature	Water level photography	Water chemistry	Ambient temperature	Barometric pressure	Relative humidity	Wind speed and direction
Schober's Resort (Wells 4A-2, 3)	X	X		X ^a	X						
Well 4A-4				X ^b	X						
Well 4H-4	X				X		X				
Well 4P-1					X		X				
Well 4H-8			X ^c				X				
Devils Kitchen	X			X ^b	X		X				
Observation Well No. 1				X ^b							
Observation Well No. 2				X ^b							
South Pool				X ^b	X	X	X	X	X	X	
Weather Station											X

^aLess than weekly monitoring.^bWeekly monitoring.^cWeekly shut-in wellhead pressures.

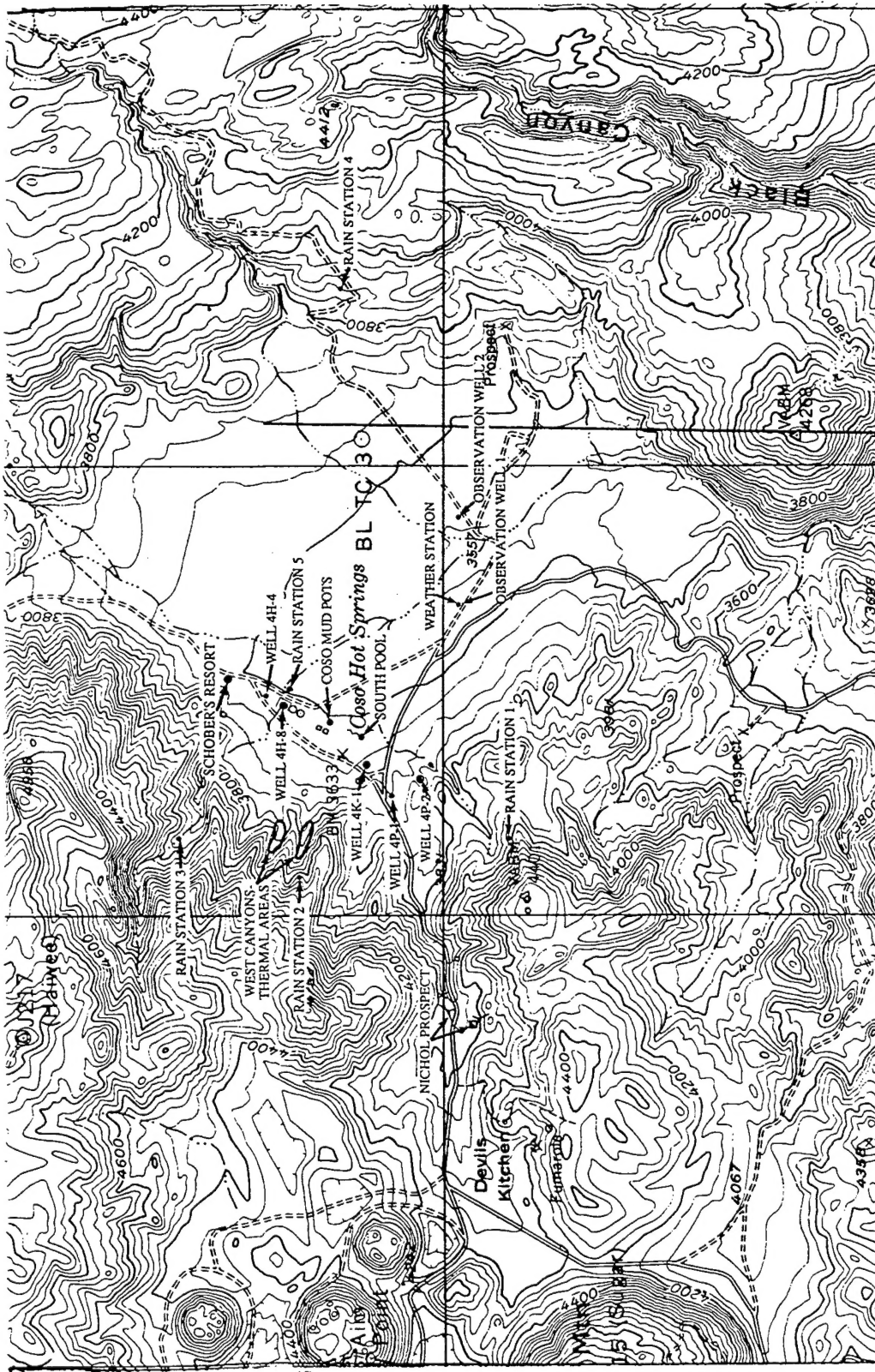


FIGURE 1. Coso Known Geothermal Resource Area Monitoring Sites.

STEAM FLOW AND TEMPERATURE MONITORING

Steam flow has been gauged at several shallow wells since the monitoring program was first initiated. While the measured steam flow from these wells represents an uncertain fraction of the total steam flow from the Coso thermal area, it does serve to monitor the relative hydrothermal activity in the area over time. Several sites are currently included in the study: Devils Kitchen, the Stove Pipe Eight-Inch Steam Well (4H-4), and Schober's Resort (4A-2 and 3). Steam temperature is also monitored at the Schober's Resort site.

The new ADScan digital recorders, first reported last year (NAWS-CL TP 006) were installed at all steam well sites. The first unit was installed on the existing Barton recorder at the Schober's Resort site on 6 April 1995, and the remaining units at the other two sites in May 1995. Some repiping between the meters and the steam lines was done at that time to meet ITT Barton's current technical specifications. Data collected by the ADScan recorders are down-loaded to a pocket-size flash memory card. The information stored in the flash memory card is then transferred into Paradox databases.

A periodic maintenance schedule has been established, in house, to ensure that the units are consistently maintained at peak efficiency and reliability. Additionally, a contract has been established with ITT Barton, Inc. for yearly maintenance and calibration of the Barton Meter/ADScan units.

DEVILS KITCHEN

Steam flow at Devils Kitchen is monitored using a Barton 25-inch water column differential pressure unit (DPU) and ADScan recorder. Daily high, low and average steam flow data collected at Devils Kitchen for the period of this report are presented in the Appendix, Table A-1. Figure 2 shows a summary graph of Devils Kitchen steam flow activity from October 1994 through September 1995.

New condensate pots and meter plumbing were installed on 22 November 1994. Data was lost from 4 January through 13 January 1995 due to a meter malfunction. The Barton meter was removed for repair from 13 through 17 February 1995. Data was lost from 14 through 21 March 1995 due to a recorder malfunction. A Barton technician installed the ADScan unit on 2 May 1995 and calibrated both the AdScan and the Barton meter on 9 May 1995.

STOVE PIPE EIGHT-INCH STEAM WELL (4H-4)

The daily steam flow for well 4H-4 is presented in the Appendix, Table A-2. This site is equipped with a 50-inch water column DPU and ADScan recorder. Figure 3 shows a summary graph of steam flow activity from October 1994 through September 1995. The meter was removed for maintenance between 13 and 17 February 1995. Data was lost from 10 through 14 March 1995 due to a recorder malfunction. New condensate pots and meter plumbing were installed 2 May 1995. A Barton technician installed the ADScan on 2 May 1995 and calibrated the ADScan and the Barton meter on 9 May 1995. Data was lost for 14 September 1995 due to a data transfer error.

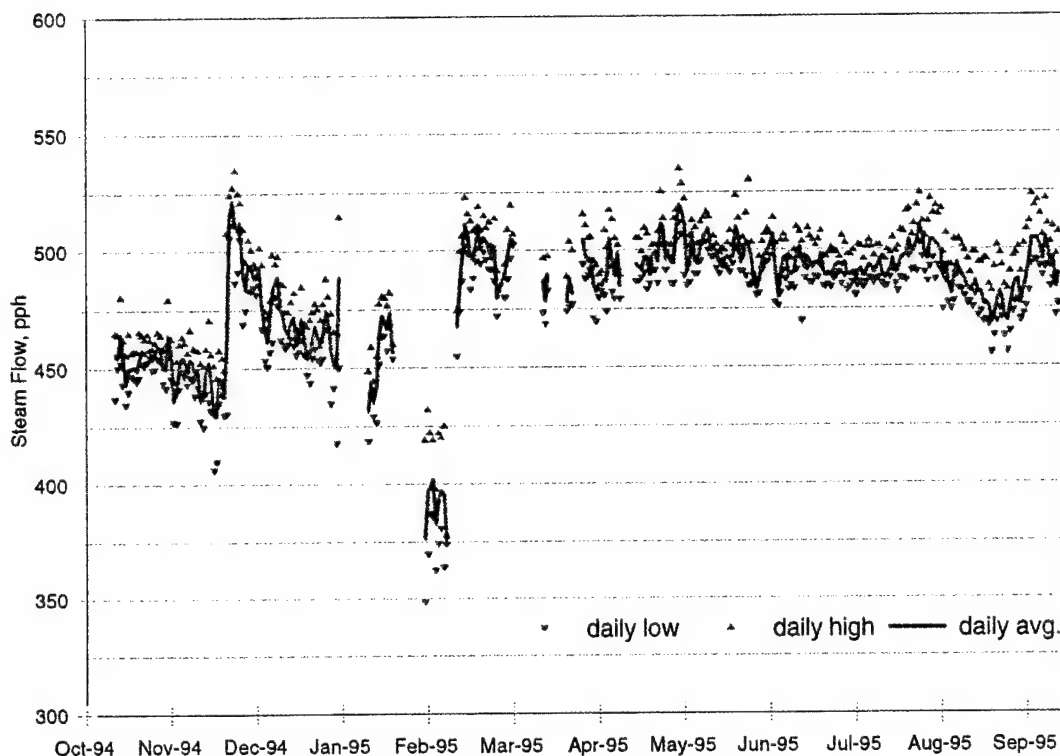


FIGURE 2. Devils Kitchen Steam Flow October 1994 Through September 1995.

SCHOBER'S RESORT (WELLS 4A-2 AND 4A-3)

The daily steam flow for wells 4A-2 and 4A-3 at Schober's Resort are presented in the Appendix, Table A-3. Steam flow at this site is equipped with a 50-inch water column DPU and ADScan recorder. Figure 4 shows a summary graph of steam flow activity from October 1994 through September 1995. No data was recorded on 21 through 30 March 1995 due to meter malfunction. New condensate pots, meter plumbing, and the ADScan unit were installed on 6 April 1995. The ADScan unit and the Barton meter were calibrated on 9 May 1995. Data was lost for 14 September 1995 due to a data transfer error.

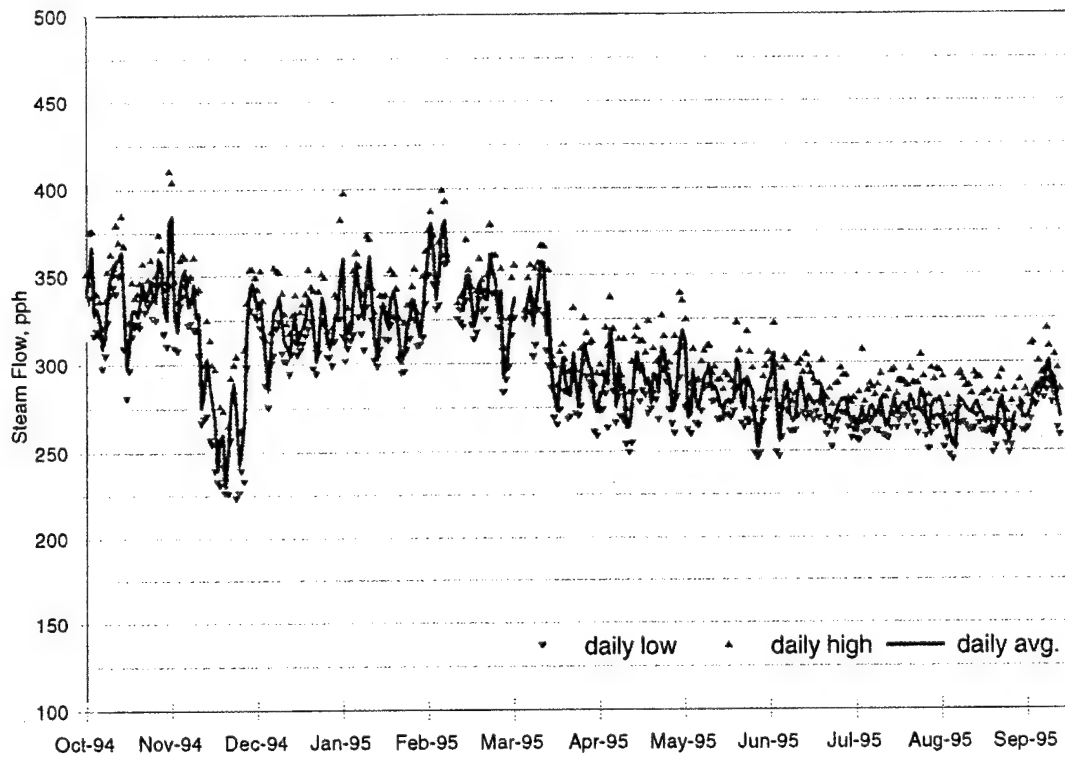


FIGURE 3. Well 4H-4 Steam Flow October 1994 Through September 1995.

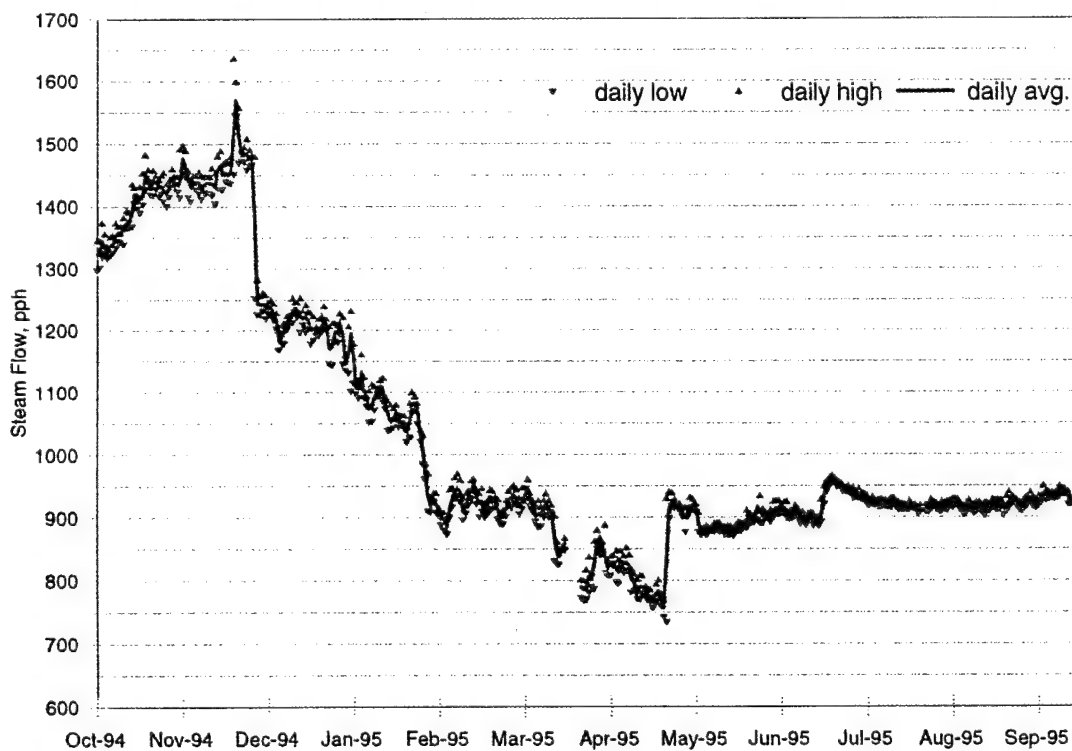


FIGURE 4. Schober's Resort Steam Flow October 1994 Through September 1995.

COSO HOT SPRINGS MUDFIELD PHOTOGRAPHIC RECORD

A weekly photographic record was initiated in January 1978 to document the fluctuation in fluid levels in several of the more prominent mud pots in the Coso KGRA. Over the years the photo record has provided a clear picture of this hot springs thermal activity. It has demonstrated the sensitivity of the hot springs to both seasonal weather changes and individual weather events, such as summer thunderstorms. It has also chronicled the changes in thermal activity that occurred throughout the Coso Hot Springs area in the late 1980's. The weekly photo record was continued through this reporting period and is catalogued and stored at the Geothermal Program Office.

Selected photographs, Figures 5 through 14, show the typical level of the thermal activity in the hot springs area throughout the past year.

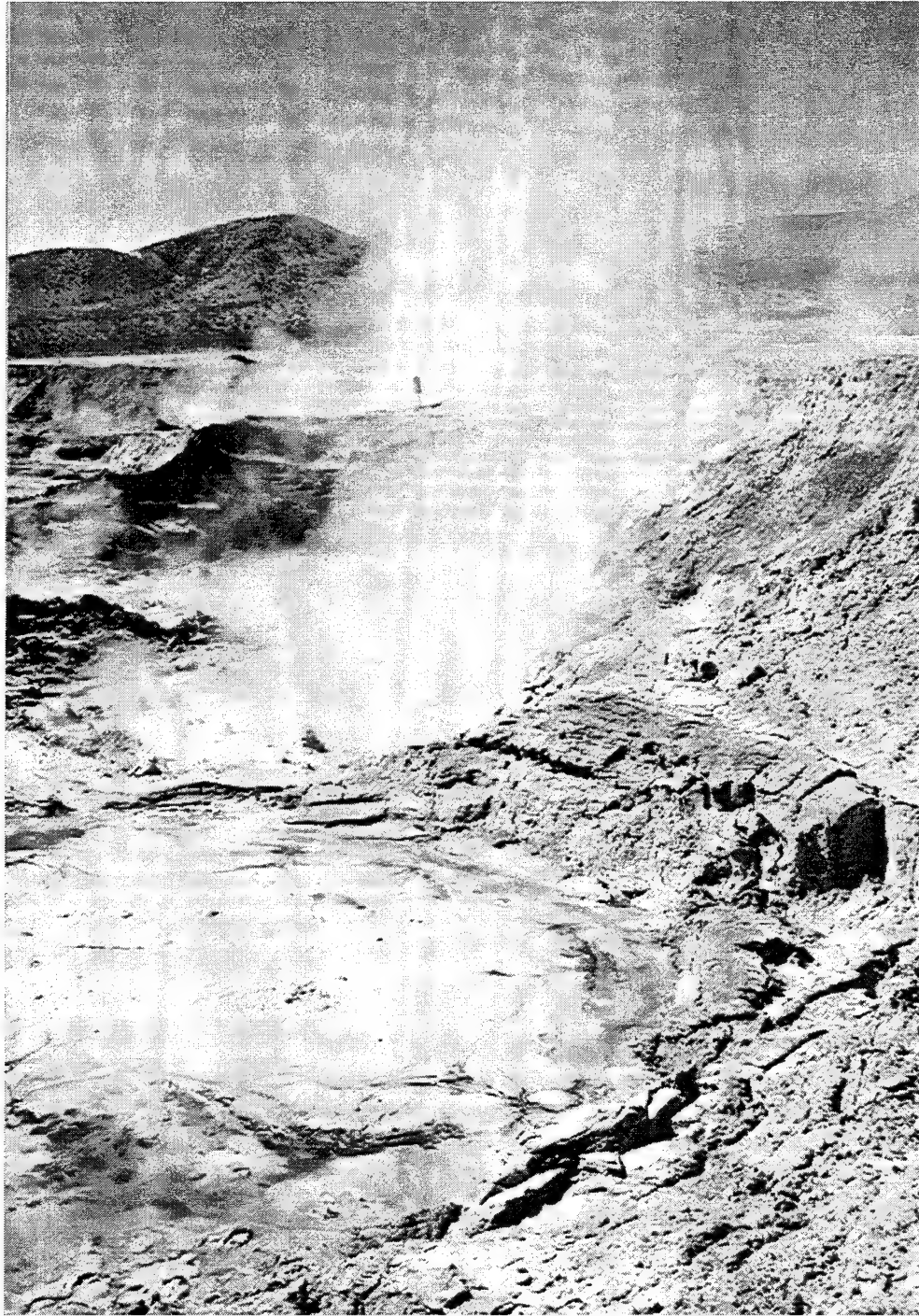


FIGURE 5. Resort Mud Pot Area, August 1995.



FIGURE 6. South Pool, August 1995.

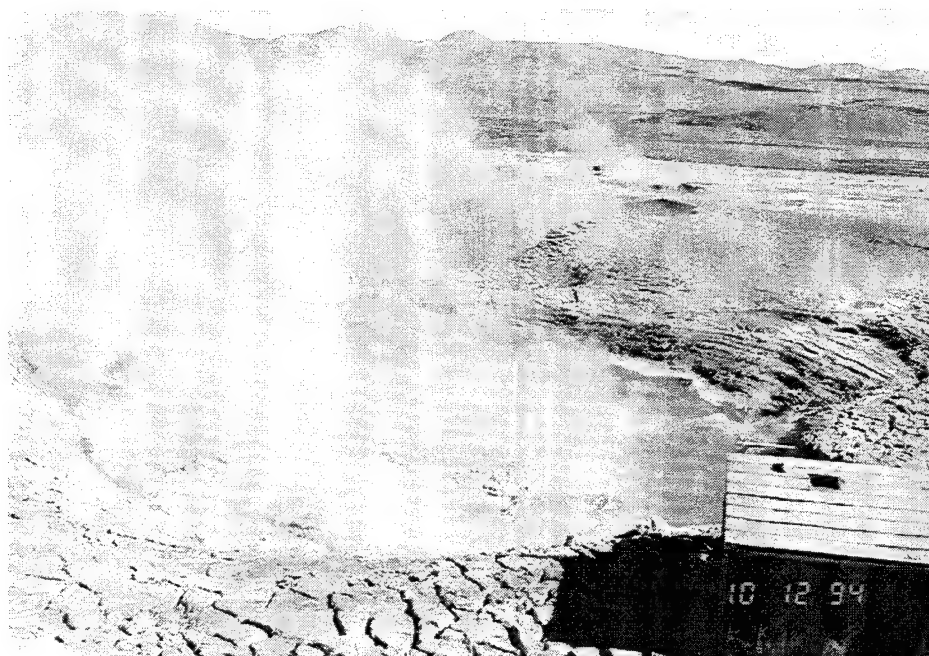


FIGURE 7. South Pool High Water Level, October 1994.



FIGURE 8. South Pool, Low Water Level, May 1995.

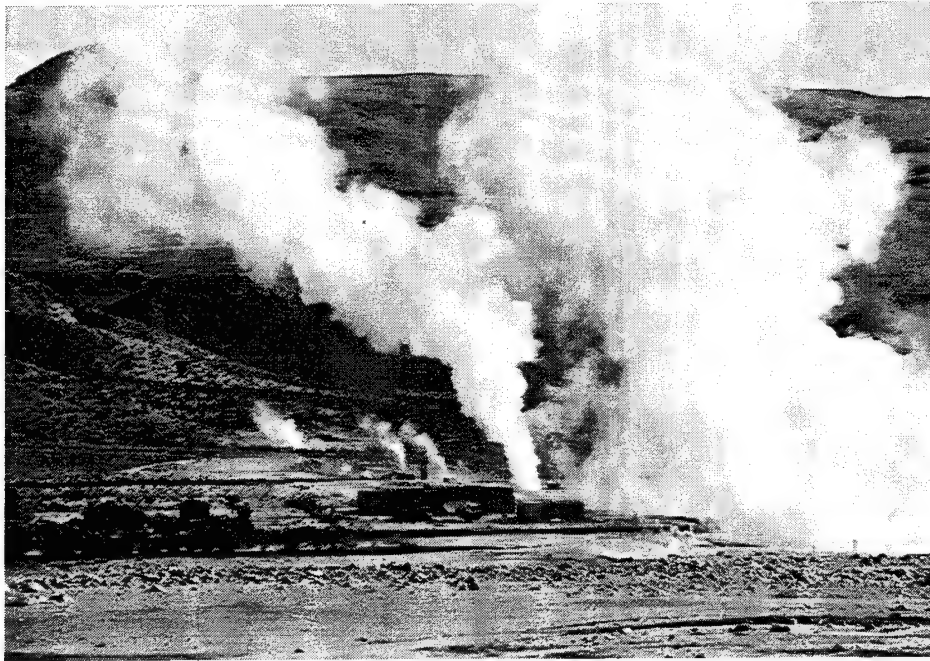


FIGURE 9. Coso Hot Springs Area, Looking From the South, April 1995.

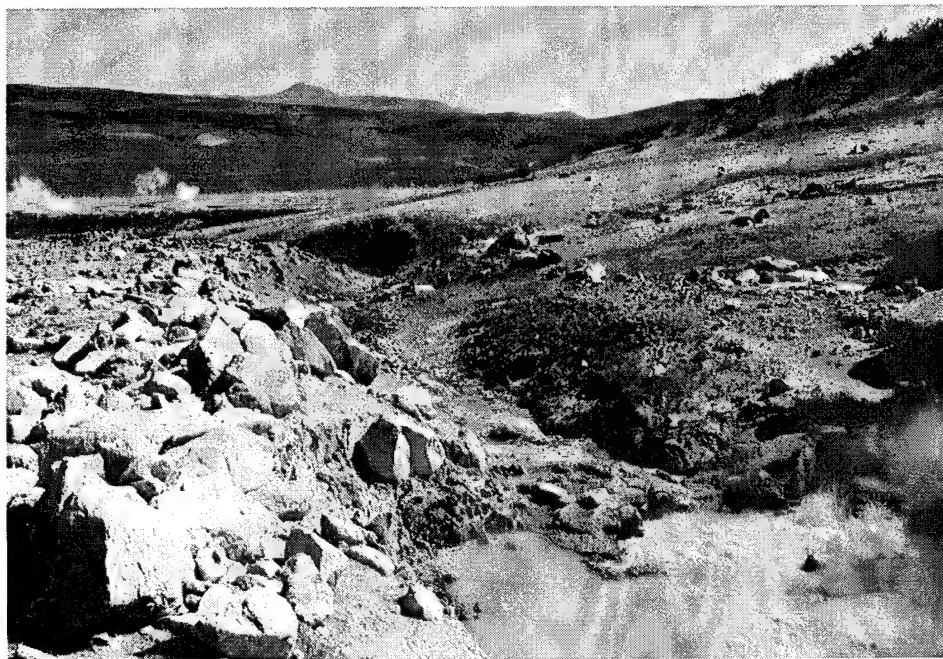


FIGURE 10. West Canyon, Looking Toward Coso Hot Springs, September 1995.

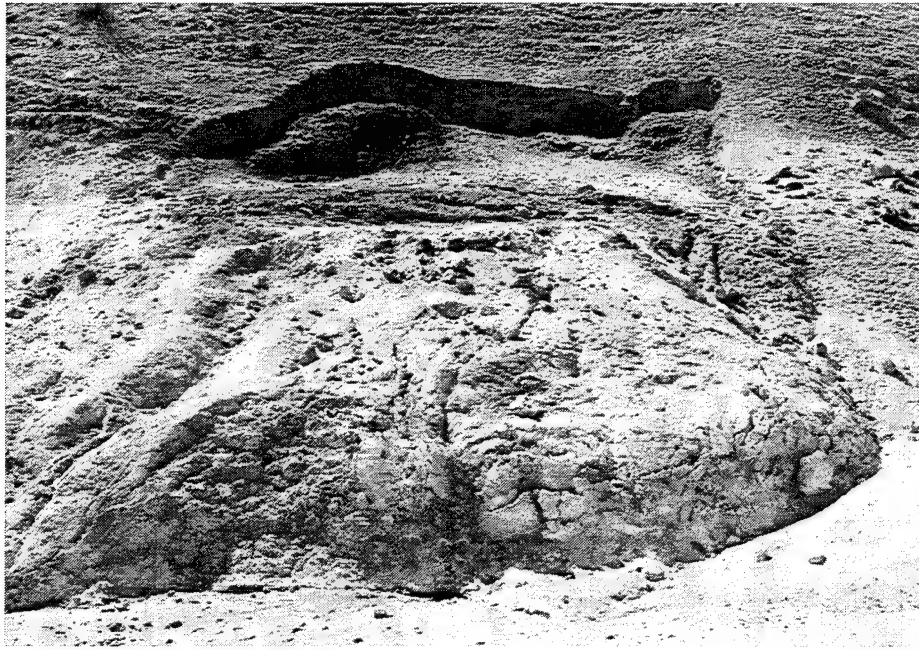


FIGURE 11. Northern West Canyon Land Slump, November 1994.

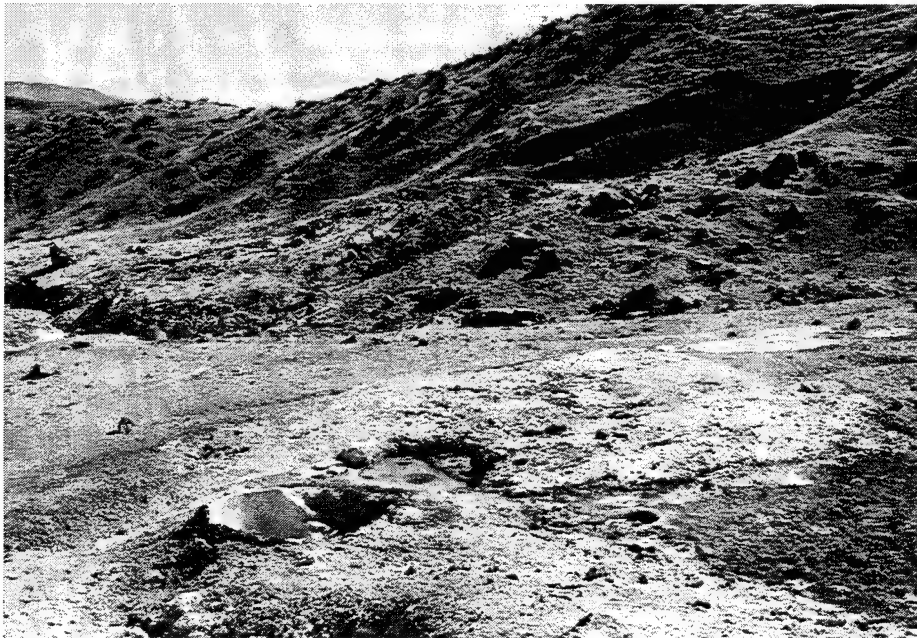


FIGURE 12. Northern West Canyon Land Slump, September 1995.

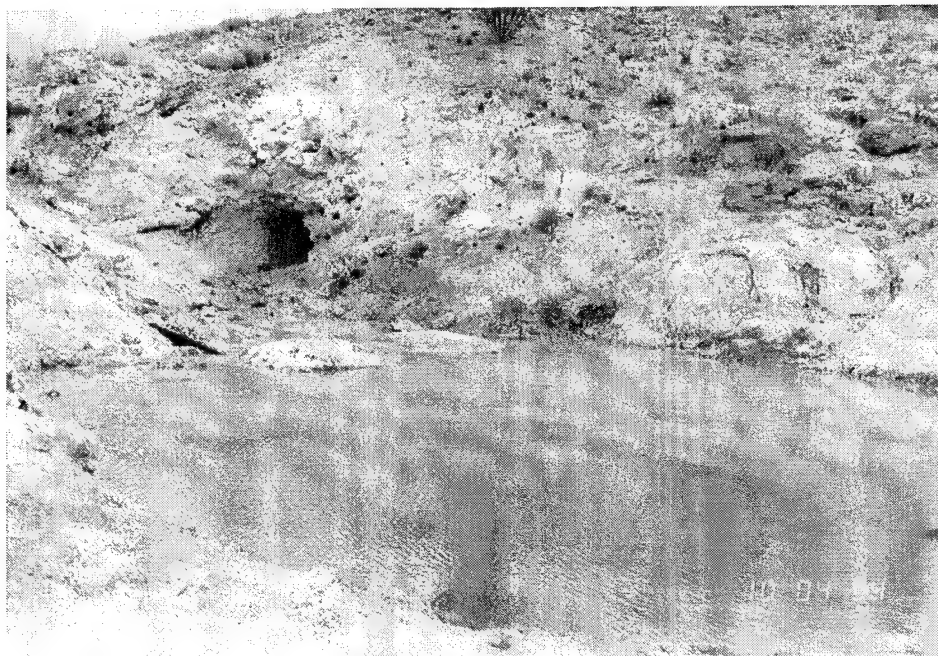


FIGURE 13. Nichol Prospect Warm Pool, October 1994.



FIGURE 14. Nichol Prospect Warm Pool, September 1995.

WATER LEVEL MONITORING

OBSERVATION WELLS

Groundwater levels are monitored in four wells. Weekly measurements are taken at wells 4P-1, OB-1, and OB-2, while the water level of another well, Coso No. 1 (4H-8), is determined indirectly from temperature logs and weekly wellhead pressure readings. These data are listed in Table 2. Figure 15 shows a summary graph of observation well water levels from 1980 to the present. Depth-to-water data has been translated to true elevation.

The fluid level elevation in well 4P-1 continues to gradually rise, from 3590.5 feet above sea level (ASL) at the beginning of the monitoring program in 1978 to 3610.5 feet ASL at the end of September 1995. Well 4P-1 is a hot, steam condensate well and is located on the upthrown side of the Coso Hot Springs fault, about 150 feet from the fault line, toward the south end of the hot springs area. It is completed in alluvial fill material.

Observation wells OB-1 and OB-2 are water wells located in the Upper Coso Basin about three-quarters of a mile east of the fault line. Both of these wells are completed in sedimentary, valley fill material. The water level elevation in OB-1 continues the decline described in previous reports, dropping from about 3432 feet ASL in 1988 to about 3392 feet ASL by September 1995. The water level in OB-2, however, rose about 10 feet during 1989 and 1990. This level appears to have stabilized at about 3365 feet ASL.

TABLE 2. Coso Observation Wells Water Level Data.

Date	Water level elevations			
	Feet, AMSL			
	Ground level at well location			Ground level
	Feet, AMSL			Feet, AMSL
	4P-1	OB-1	OB-2	Coso 1
	3662.0	3570.0	3560.0	3615.0
	Water level measurements			Water level ^a
	4P-1	OB-1	OB-2	Coso 1
4-Oct-94	3606.6	3398.0	3364.3	
11-Oct-94	3606.6	3400.0	3364.6	
18-Oct-94	3606.6	3397.8	3364.3	
25-Oct-94	3606.6	3397.7	3364.3	
1-Nov-94	3606.6	3397.7	3364.6	
8-Nov-94	3607.3	3397.2	3364.3	
15-Nov-94	3607.6	3397.4	3364.3	
22-Nov-94	3608.3	3397.1	3364.3	
29-Nov-94	3609.8	3397.1	3364.3	
13-Dec-94	3610.4	3398.2	3364.3	
20-Dec-94	3609.9	3397.7	3364.3	
4-Jan-95	3610.4	3397.8	3364.8	
13-Jan-95	3610.4	3396.6	3364.1	

TABLE 2. (Contd).

Date	Water level elevations			
	Feet, AMSL			
	Ground level at well location			Ground level
	Feet, AMSL			Feet, AMSL
	4P-1	OB-1	OB-2	Coso 1
	3662.0	3570.0	3560.0	3615.0
	Water level measurements			Water level ^a
	4P-1	OB-1	OB-2	Coso 1
18-Jan-95	3610.4	3396.7	3364.3	3305.0
26-Jan-95	3610.4	3397.4	3365.0	
2-Feb-95	3610.4		3364.3	
7-Feb-95	3610.4	3397.8	3364.8	
13-Feb-95	3609.6	3398.1	3364.3	
21-Feb-95	3610.4		3364.3	
28-Feb-95	3610.4	3395.8	3364.3	
7-Mar-95	3610.4	3395.6	3363.9	
14-Mar-95	3610.4	3395.5	3363.2	
21-Mar-95	3610.8	3395.7	3364.3	
30-Mar-95	3610.8	3395.9	3363.2	
5-Apr-95	3610.4	3396.0	3364.3	
11-Apr-95	3610.4	3395.2	3363.2	
18-Apr-95	3610.8	3395.2	3363.2	
25-Apr-95	3610.8	3395.2	3363.2	
3-May-95	3610.4	3395.2	3363.2	
9-May-95	3610.4	3394.1	3363.2	
16-May-95	3610.4	3395.2	3363.2	
23-May-95	3610.4	3394.1	3363.2	
30-May-95	3610.8	3394.1	3363.2	
6-Jun-95	3610.8	3394.1	3363.2	
13-Jun-95	3610.8	3394.1	3363.2	
20-Jun-95	3610.4	3392.9	3364.3	
27-Jun-95	3610.4	3392.9	3364.3	
7-Jul-95	3610.4	3392.9	3364.3	
11-Jul-95	3610.4	3392.9	3364.3	
18-Jul-95	3610.4	3392.9	3364.3	
25-Jul-95	3610.4	3392.9	3364.3	
1-Aug-95	3610.4	3392.9	3363.2	
9-Aug-95	3610.4	3392.9	3364.3	
15-Aug-95	3610.8	3392.9	3364.3	
22-Aug-95	3610.8	3392.9	3364.3	
29-Aug-95	3610.8	3392.9	3365.5	3300.0
5-Sep-95	3610.4	3392.9	3365.5	
12-Sep-95	3610.4	3392.9	3365.5	
19-Sep-95	3610.4	3391.8	3366.6	
26-Sep-95	3610.4	3391.8	3366.6	

^a Coso 1 water level is determined indirectly from temperature logs.

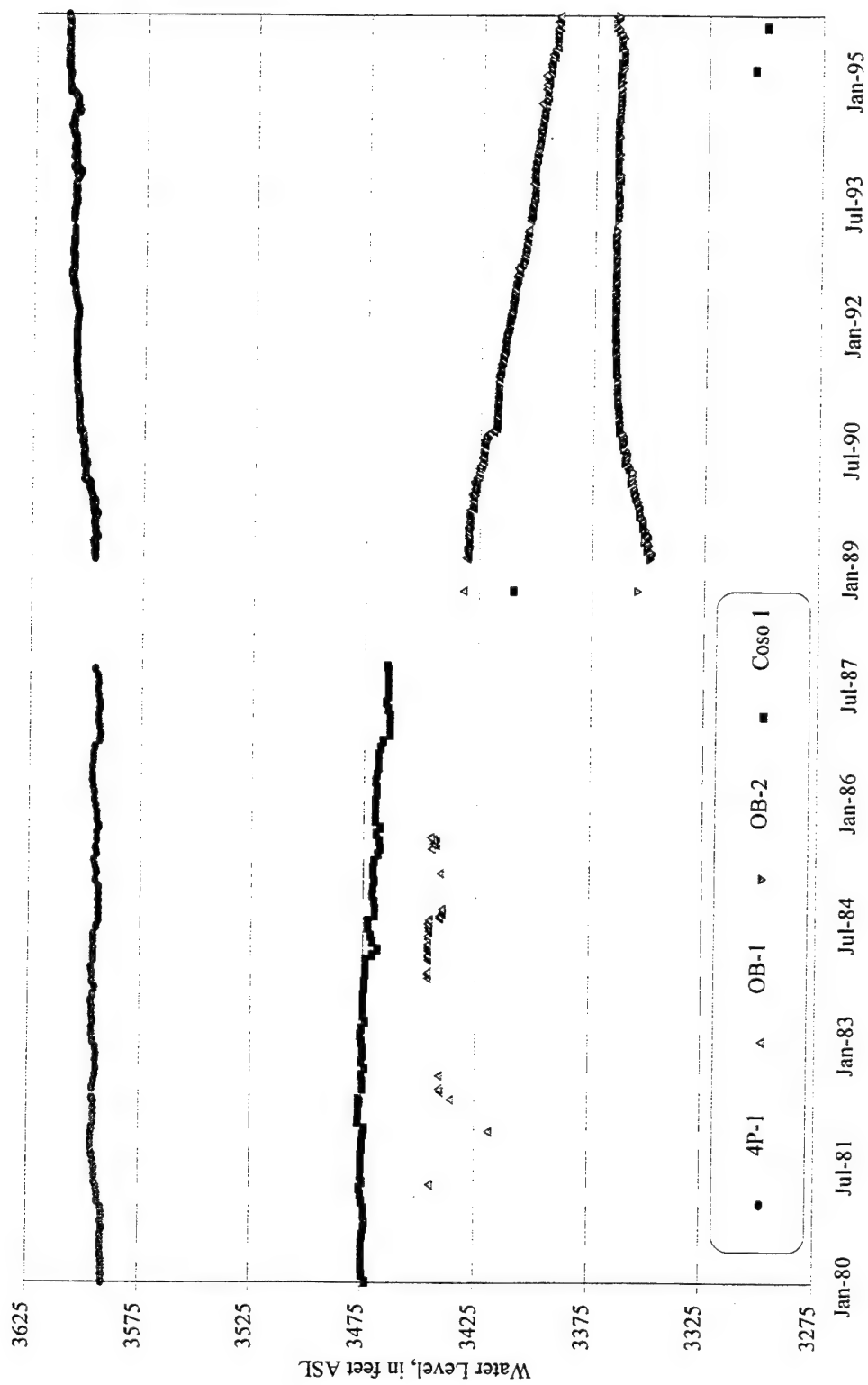


FIGURE 15. Water Levels in Coso Observation Wells, January 1980 Through September 1995.

Coso No. 1 is located toward the north end of the Coso Hot Springs fault and is completed in bedrock. The fluid level in Coso No. 1 declined slightly from 3473 to about 3465 feet ASL between 1978 and October 1987. At that lowered fluid level, the well began to boil. The fluid level then dropped rapidly to about 3410 feet by September 1988, and the wellbore became plugged with salt and scale. Coso No. 1 was rehabilitated in 1993 and shut-in to reduce boiling and scaling. The current fluid level (determined from the temperature gradient log) is at about 3300 feet ASL.

Shut-in wellhead pressures for Coso No. 1 are recorded weekly from both the 4-inch wellbore and the 7-inch intermediate casing around the wellbore. The wellbore is completed to 370 feet in bedrock, while the intermediate casing is set to 194 feet at the alluvium/bedrock interface. Table 3 is a listing of the current years' recorded pressures. Figure 16 is a summary graph of these pressures from November 1993 to the present.

NAWS-CL TP 007

TABLE 3. Shut-in Wellhead Pressure, Coso No. 1.

Date	7-inch casing, psig	4-inch casing, psig
4-Oct-94	23.0	20.5
11-Oct-94	23.0	21.0
18-Oct-94	23.0	20.0
25-Oct-94	23.0	21.0
1-Nov-94	23.0	21.0
8-Nov-94	23.0	20.0
15-Nov-94	23.0	20.0
22-Nov-94	23.0	21.0
29-Nov-94	23.0	21.0
13-Dec-94	23.0	20.0
20-Dec-94	No data	No data
4-Jan-95	No data	No data
13-Jan-95	No data	No data
18-Jan-95	No data	No data
26-Jan-95	23.0	21.0
2-Feb-95	23.0	21.0
7-Feb-95	22.0	21.0
13-Feb-95	22.0	21.0
21-Feb-95	22.0	21.0
28-Feb-95	22.0	20.0
7-Mar-95	22.0	20.0
14-Mar-95	22.0	20.0
21-Mar-95	22.0	20.0
30-Mar-95	22.0	20.0
5-Apr-95	22.0	21.0
11-Apr-95	22.0	20.0
18-Apr-95	22.5	19.5
25-Apr-95	22.0	20.0
3-May-95	22.0	20.0
9-May-95	22.5	20.0
16-May-95	22.5	20.0
23-May-95	22.5	20.0
30-May-95	22.5	20.0
6-Jun-95	22.5	20.0
13-Jun-95	23.0	20.0
20-Jun-95	23.0	20.0
27-Jun-95	22.5	20.0
7-Jul-95	22.5	20.0
11-Jul-95	23.5	20.0
18-Jul-95	22.5	20.0
25-Jul-95	22.5	20.0
1-Aug-95	22.5	20.0
9-Aug-95	22.5	20.0
15-Aug-95	22.5	20.0
22-Aug-95	22.5	20.0
29-Aug-95	22.5	20.0
5-Sep-95	22.5	20.0
12-Sep-95	21.5	20.0
19-Sep-95	21.5	20.0
26-Sep-95	21.5	20.0

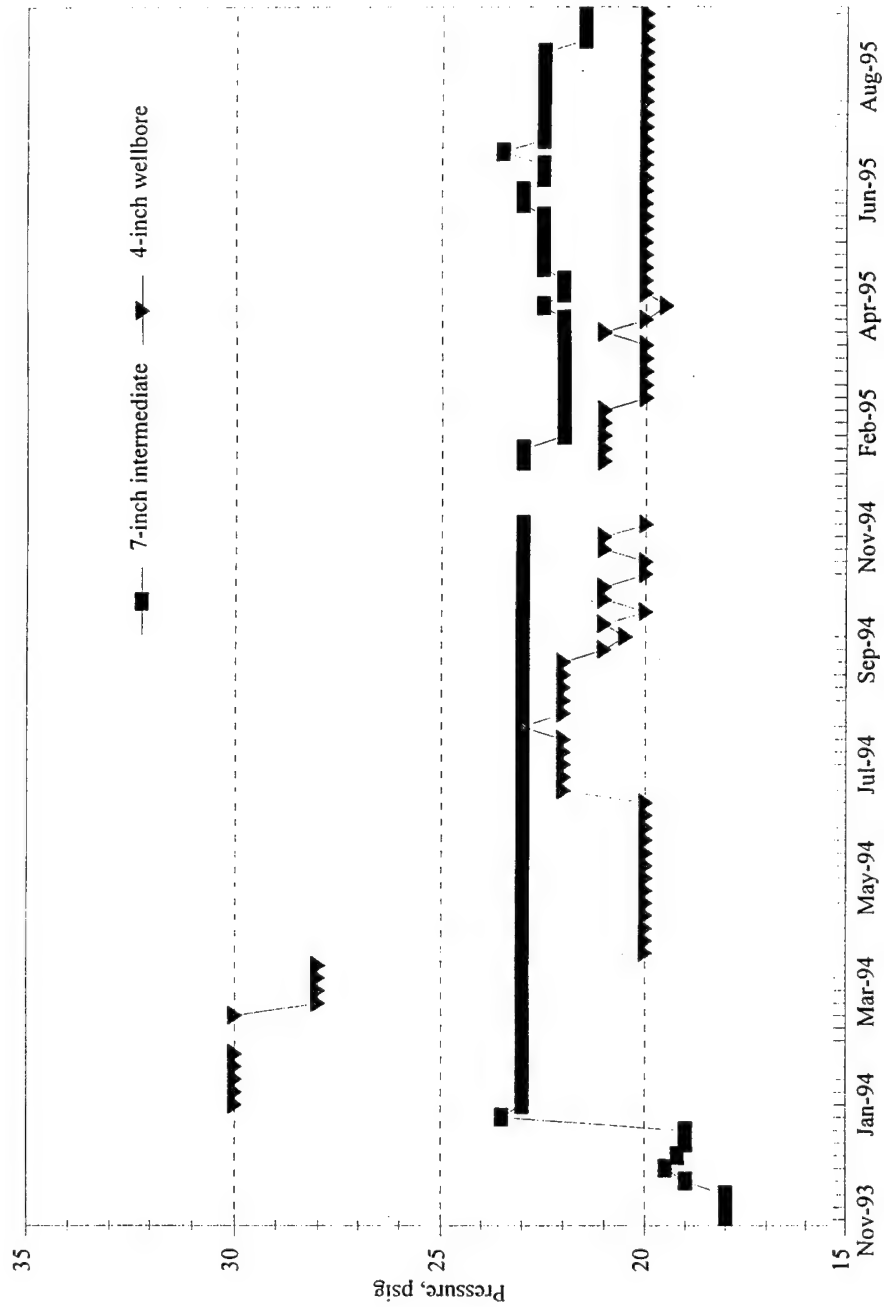


FIGURE 16. Shut-in Wellhead Pressure, Coso No. 1, November 1993 to September 1995.

SOUTH POOL

The South Pool water level has continued the pattern of seasonal fluctuations throughout this reporting period, ranging from a low of 3612.4 feet in October 1994 to a high of 3620.1 feet on 30 May 1995 (Table 4). The pool's temperature is periodically measured, as conditions permit. Water temperatures for this period averaged above 202°F. The temperature and water elevations of the pool for January 1988 through September 1995, the period of increased activity, are shown graphically in Figure 17 while the pool elevation recorded for the entire monitoring program is shown in Figure 18.

TABLE 4. South Pool Elevation and Temperature Changes.

Date	Elevation, ft	Temperature, °F	Date	Elevation, ft	Temperature, °F
4-Oct-94	3612.4	212	25-Jul-95	3618.2	
18-Oct-94	3612.5	211	1-Aug-95	3617.6	202
1-Nov-94	3612.5	213	9-Aug-95	3617.4	203
15-Nov-94	3612.8	212	15-Aug-95	3616.9	203
30-Nov-94	3613.7	211	22-Aug-95	3616.8	203
13-Dec-94	3614.7	210	29-Aug-95	3616.7	
20-Dec-94	3614.8	212	5-Sep-95	3616.6	204
4-Jan-95	3615.1		12-Sep-95	3616.5	
13-Jan-95	3616.0		19-Sep-95	3616.5	204
18-Jan-95	3617.4	210	26-Sep-95	3616.4	199
26-Jan-95	3617.5				
2-Feb-95	3617.9	212			
8-Feb-95	3618.3				
13-Feb-95	3618.2	212			
21-Feb-95	3618.1				
28-Feb-95	3618.6	208			
7-Mar-95	3619.4	204			
14-Mar-95	3619.4	197			
21-Mar-95	3619.2				
30-Mar-95	3619.1				
5-Apr-95	3619.1				
11-Apr-95	3619.1	197			
18-Apr-95	3619.2				
25-Apr-95	3619.3				
3-May-95	3619.5	201			
9-May-95	3619.6	203			
16-May-95	3619.9	203			
23-May-95	3619.9	202			
30-May-95	3620.1	202			
6-Jun-95	3619.9	203			
13-Jun-95	3619.7	194			
20-Jun-95	3619.6				
27-Jun-95	3619.3	184			
7-Jul-95	3619.0	190			
11-Jul-95	3618.6	202			
18-Jul-95	3618.3	201			

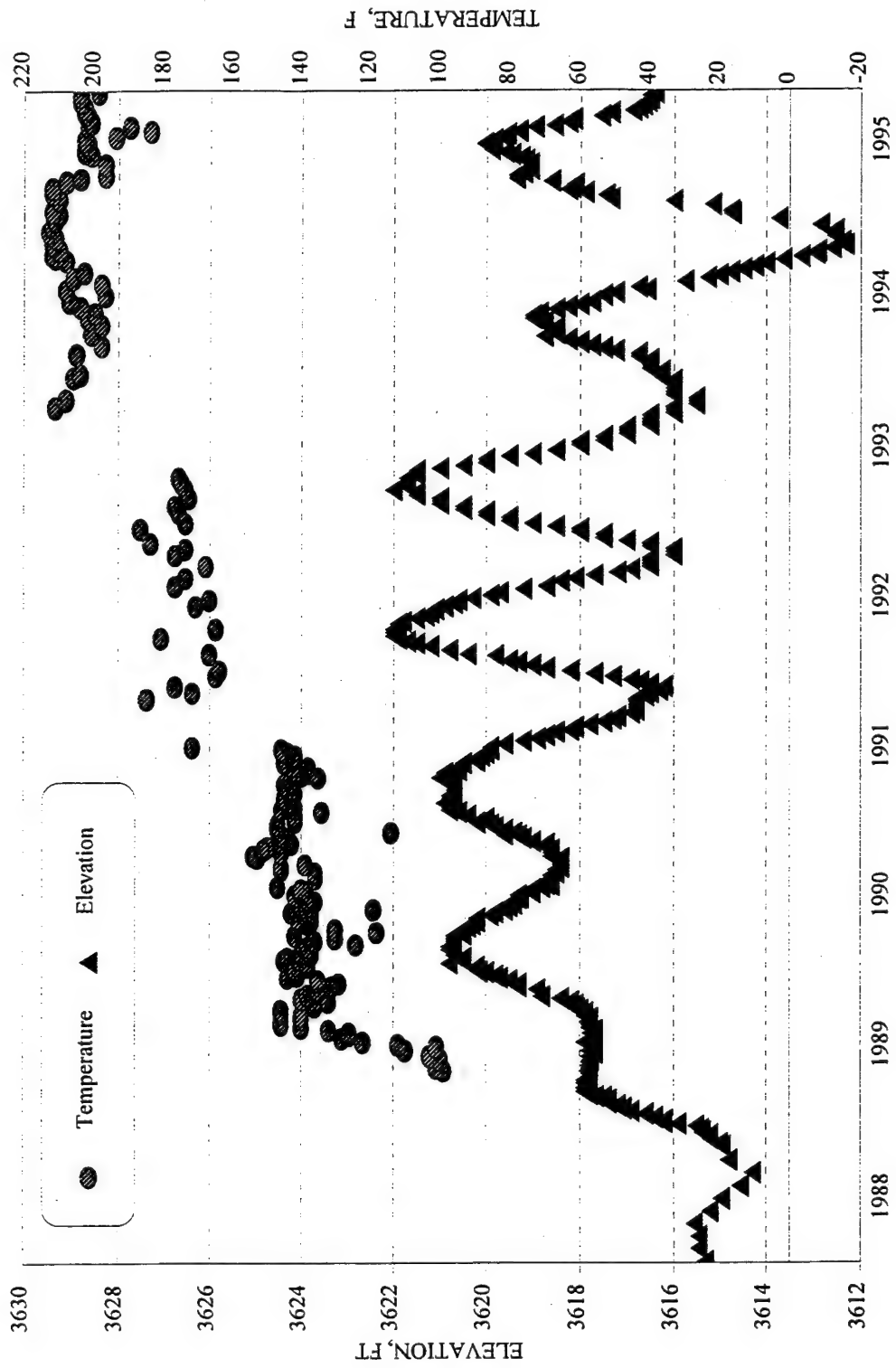


FIGURE 17. South Pool Elevation and Temperature, January 1988 Through September 1995.

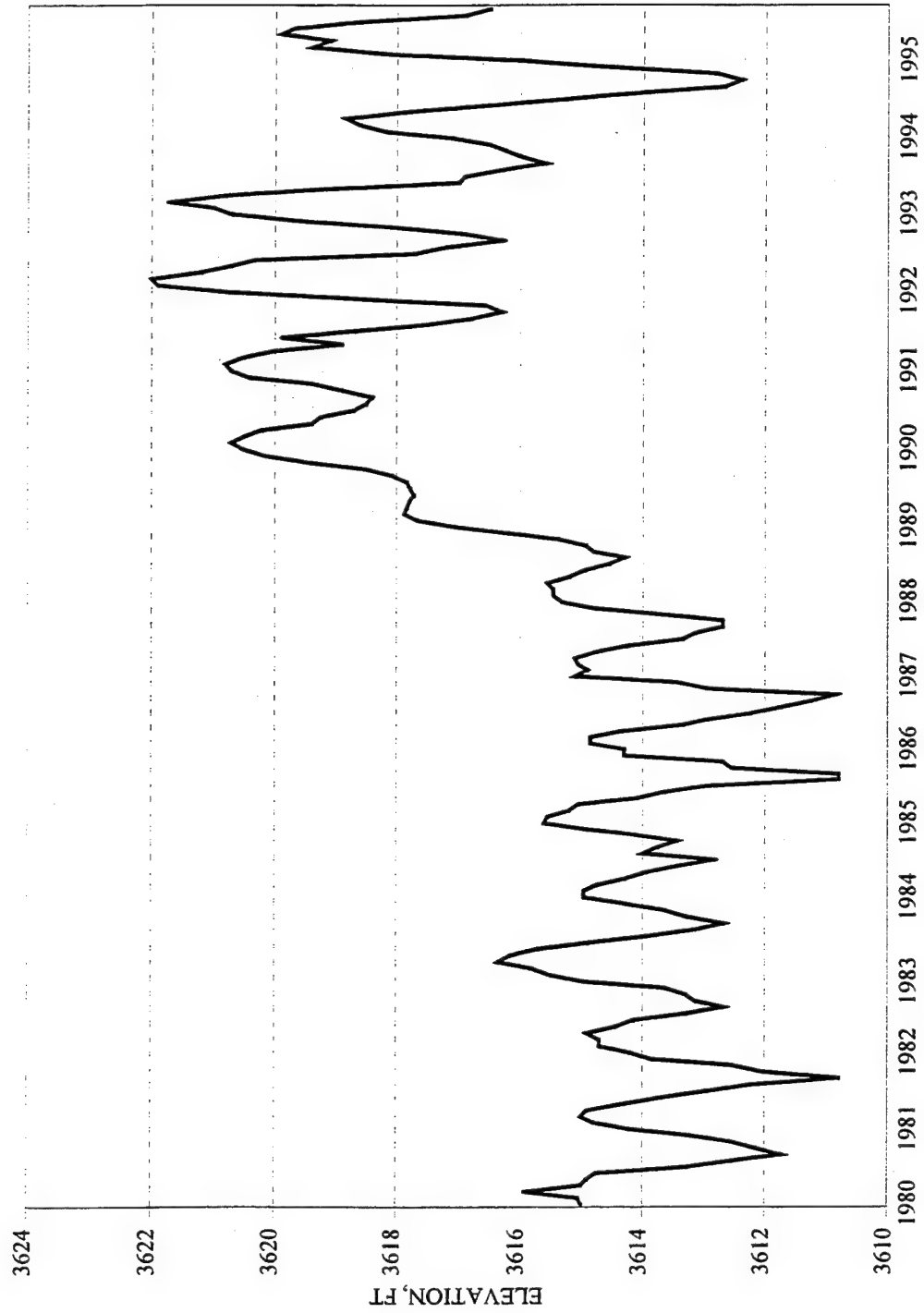


FIGURE 18. South Pool Elevations, 1980 Through September 1995.

RAINFALL AT COSO RESORT AREA AND ROSE VALLEY

Rainfall in the Coso Hot Springs basin is monitored at five rain station sites, as mapped in Figure 1. The Rose Valley data are collected at the Los Angeles Department of Water and Power Haiwee Reservoir Plant. Instrumentation at each site consists of a battery-operated long-term strip recorder that is triggered by a tipping bucket. This year no interruptions in rainfall data collection occurred.

Data from the Coso rain stations and the Rose Valley data from the Haiwee power plant are presented in Table 5 and Figure 19. Comparative rainfall data for Coso Basin, Rose Valley, and Indian Wells Valley (IWV) for the period 1966 through 1994 are shown in Figure 20. The Indian Wells Valley data were gathered at Armitage Field, Naval Air Warfare Center Weapons Division (NAWCWPNS), and provided by a NAWCWPNS meteorologist.

TABLE 5. Rainfall Recorded at the Coso Rain Stations and Rose Valley.

Coso Hot Springs area						Rose Valley	
Date	Tipping bucket stations (rainfall, in.)					Date	Rainfall, in.
	1	2	3	4	5		
18-Oct-94					0.01	5-Oct-94	0.08
10-Nov-94	0.24	0.16	0.10		3.00	18-Nov-94	0.05
19-Nov-94	0.01					26-Nov-94	0.03
24-Dec-94	0.01	0.01				4-Dec-94	0.01
25-Dec-94	0.13	0.09	0.12			23-Dec-94	0.01
3-Jan-95	0.04	0.10	0.06		0.02	25-Dec-94	0.16
5-Jan-95		0.47	0.98			26-Dec-94	0.04
6-Jan-95		0.16	0.01			29-Dec-94	0.10
7-Jan-95	0.28	0.25	0.21			3-Jan-95	0.10
9-Jan-95	0.02					4-Jan-95	0.24
10-Jan-95	1.27	0.78	0.54		0.06	5-Jan-95	1.62
11-Jan-95	0.03	0.03	0.02			7-Jan-95	0.14
12-Jan-95	0.01		0.02			8-Jan-95	0.10
14-Jan-95	0.01					9-Jan-95	0.01
20-Jan-95					0.02	10-Jan-95	0.09
21-Jan-95	0.05	0.10	0.06			11-Jan-95	0.57
22-Jan-95	0.07	0.03	0.06			12-Jan-95	0.05
23-Jan-95	0.85	0.15	0.70			15-Jan-95	0.06
24-Jan-95	1.09		0.64			21-Jan-95	0.06
25-Jan-95	1.03		0.66			23-Jan-95	0.28
27-Jan-95				0.01		24-Jan-95	0.85
28-Jan-95					0.02	25-Jan-95	1.40
9-Feb-95	0.01					26-Jan-95	0.56
14-Feb-95	0.26	0.33	0.23			29-Jan-95	0.03
28-Feb-95	0.01	0.01			0.02	8-Feb-85	0.01

TABLE 5. (Contd.)

Coso Hot Springs area						Rose Valley	
Date	Tipping bucket stations (rainfall, in.)					Date	Rainfall, in.
	1	2	3	4	5		
10-Mar-95	1.25	1.17	0.49		0.06	14-Feb-95	0.56
11-Mar-95	0.56	0.72	1.14		0.08	3-Mar-95	0.02
23-Mar-95	0.23	0.22	0.10			10-Mar-95	0.35
13-Apr-95	0.02					11-Mar-95	1.56
16-Apr-95	0.04		0.07		0.02	23-Mar-95	0.06
17-Apr-95							
18-Apr-95	0.02	0.02	0.03		0.02	19-Apr-95	0.03
20-Apr-95				0.01			
29-Apr-95			0.01	0.02			
30-Apr-95				0.02			
1-May-95				0.01			
6-May-95	0.08	0.02	0.14		0.07	5-May-95	0.08
12-May-95				0.02		6-May-95	0.04
13-May-95				0.01			
14-May-95		0.02	0.05		0.03		
19-May-95	0.10						
22-May-95		0.02	0.01		0.01		
23-May-95		0.06	0.10		0.12	23-May-95	0.11
24-May-95		0.06	0.16		0.14	24-May-95	0.05
26-May-95					0.01	27-May-95	0.13
27-May-95	0.01		0.01				
5-Jun-95				0.01			
6-Jun-95				0.01			
7-Jun-95				0.01			
8-Jun-95	0.07						
16-Jun-95		0.04	0.12		0.10		
25-Jun-95	0.01						
26-Jun-95	0.11	0.10	0.06		0.02	30-Jun-95	0.15
21-Aug-95	0.01		0.01				
TOTAL	7.93	5.12	6.91	0.13	3.83	TOTAL	9.69

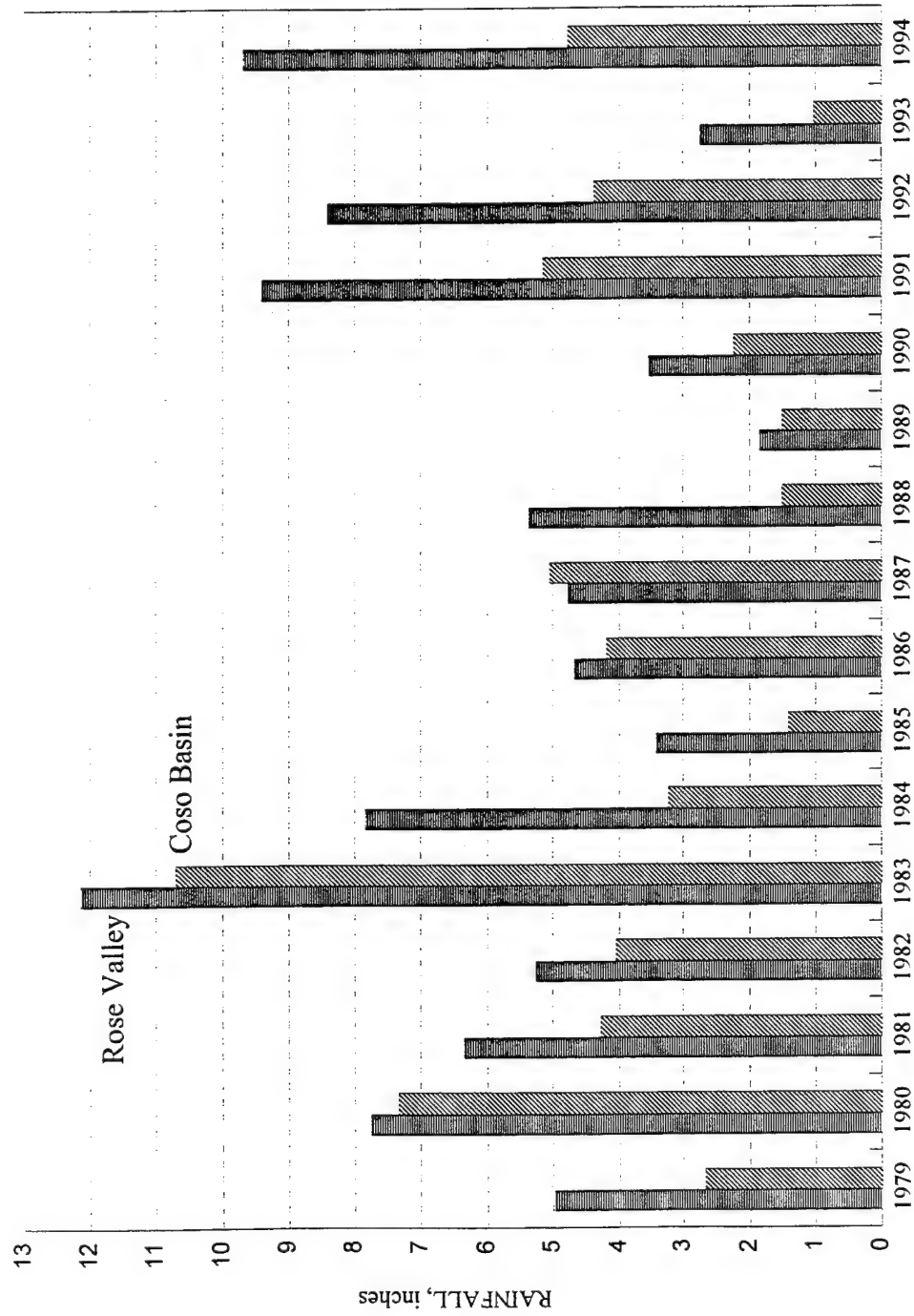


FIGURE 19. Comparison of Total Rainfall at Coso Basin and Rose Valley, 1979 Through 1994.

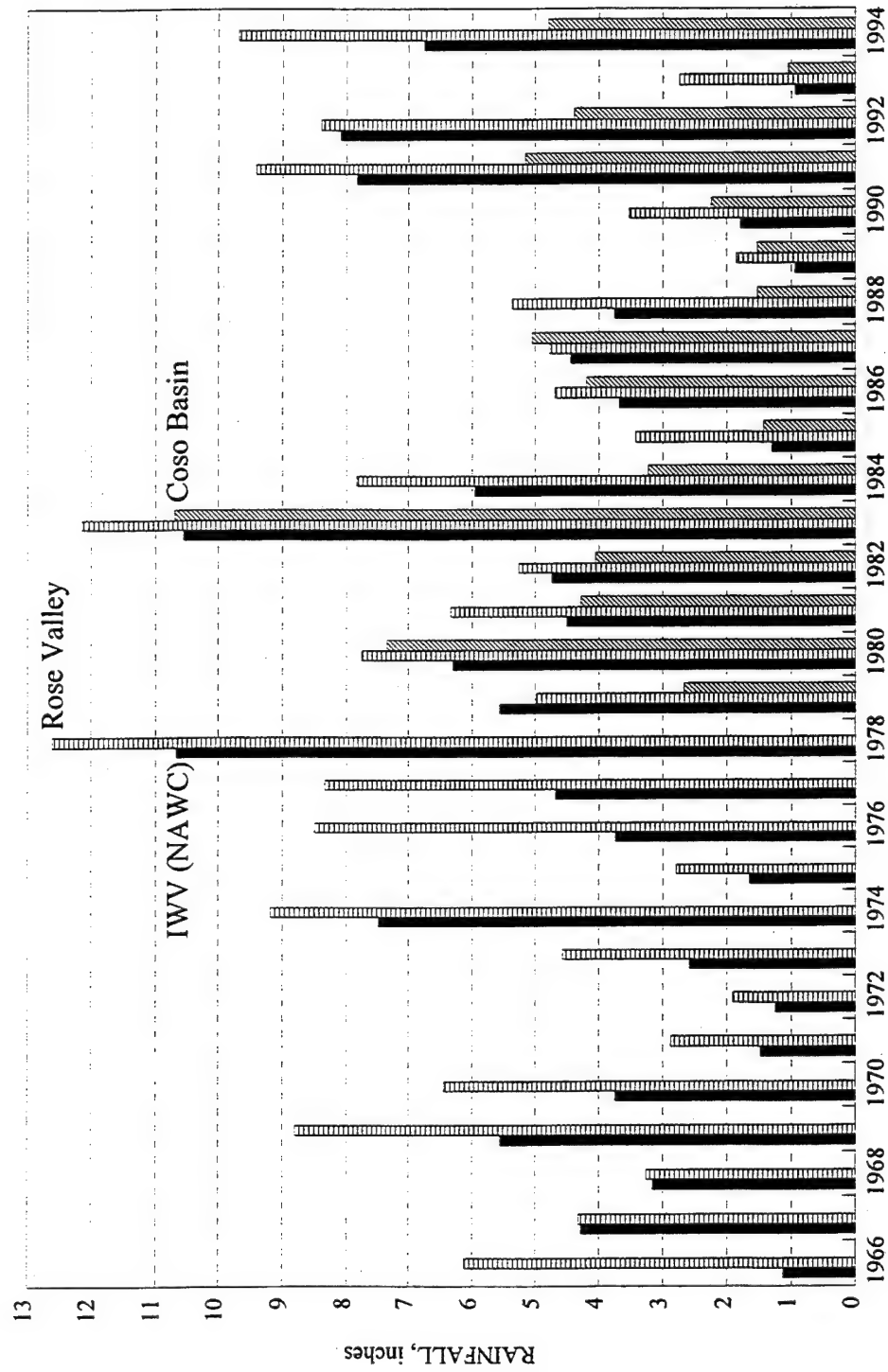


FIGURE 20. Comparison of Total Rainfall at Coso Basin, Rose Valley, and NAWC Sites, 1966 Through 1994.

**COSO HOT SPRINGS MINI-WEATHER
RECORDING STATION**

Barometric pressure, ambient temperature, relative humidity, wind speed, and wind direction are recorded at Weather Station 1, located adjacent to observation well OB-1. No data problems were experienced this past year. Biannual equipment calibration at the weather station is conducted by Metrology Branch personnel (C32542/522600D).

The barometric pressure, ambient temperature, relative humidity are presented in Figure 21. This hourly data set is expansive and will not be published. It is available from the Geothermal Program Office upon request.

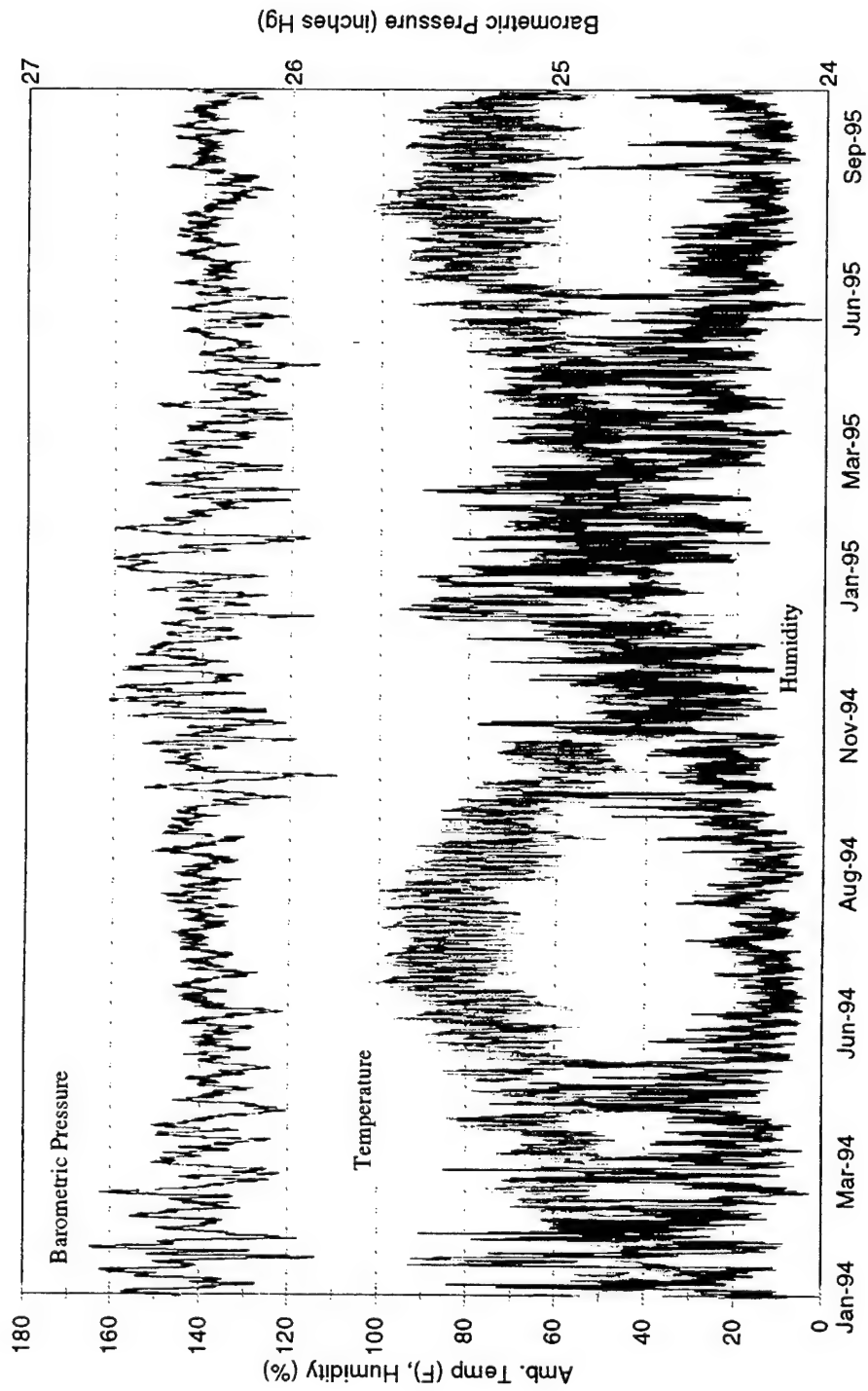


FIGURE 21. Weather Station One, Hourly Data, 19 January 1994 Through 30 September 1995.

WATER ANALYSIS OF COSO HOT SPRINGS AREA

Water samples were collected from several sites in the Coso Hot Springs area. These samples were analyzed for a suite of geothermal constituents by B.C. Laboratories, Inc., of Bakersfield, California. The results are provided in Table 6. The wells 4K-1, Coso No. 1 (4H-4), 4P-1, and OB-1; as well as the sites: Devils Kitchen, South Pool, West Canyon, Nichol Pool, and Nichol Shaft, were analyzed.

TABLE 6. Chemical Analysis of Coso Hot Springs Area Surface and Near-Surface Thermal Waters. 1995 water testing.

Constituents	Units	4K-1 on 3/15	Coso #1 (4H-8) on 3/6	Nichol Pool on 3/15	Nichol Shaft on 3/15	West Canyon on 3/15	4P-1 on 3/15	OB-1 on 6/23	South Pool on 3/15	Devil's Kitchen on 3/21
Calcium	mg/L	3.3	2.4	60.0	102.0	86.0	56.0	26.0	254.0	59.0
Magnesium	mg/L	0.18	0.02	12.70	31.00	17.50	0.70	2.90	108.00	23.00
Sodium	mg/L	41.0	6590.0	757.0	66.0	126.0	131.0	1020.0	189.0	41.0
Potassium	mg/L	7.5	346.0	112.0	33.0	30.0	62.0	90.0	65.0	31.0
Carbonate	mg/L	a	1520.0	a	a	a	a	a	a	a
Bicarbonate	mg/L	60.0	a	a	a	a	92.2	227.0	a	a
Chloride	mg/L	4.0	3320.0	1330.0	104.0	9.6	22.8	1530.0	233.0	2.1
Sulfate	mg/L	51	366	540	1180	660	396	0	2590	1030
Fluoride	mg/L	0.32	160.00	0.21	1.20	2.90	0.31	5.10	0.18	0.41
Bromide	mg/L	0.13	5.20	2.20	0.32	0.06	0.26	2.70	a	a
pH	pH units	7.2	11.8	2.3	2.6	3.3	7.3	7.5	3.9	2.2
Electrical Conductivity	umhos/ cm	234	23600	6500	3000	1550	1100	5500	5200	4500
Total Dissolved Solids	mg/L	400	21600	3170	2320	1270	1150	3300	4670	1410
Total Acidity	mg/L	b	b	7.00	16.00	3.60	b	b	24.00	11.00
Aluminum	µg/L	a	a	6000	16000	a	a	a	542	11000
Antimony	µg/L	a	a	a	a	a	a	a	a	a
Arsenic	µg/L	6.0	206000.0	980.0	40.0	11.0	12.0	2340.0	68.0	18.0
Boron	µg/L	0.31	118.00	32.00	1.80	0.34	0.11	41.00	19.00	4.40
Copper	µg/L	a	11	23	a	44	23	a	a	a
Lithium	µg/L	49	47400	3520	79	41	80	9080	141	77
Manganese	µg/L	43	a	2000	1800	3600	443	170	4800	1820
Mercury	µg/L	6.0	a	7.5	a	a	15.0	1.2	0.3	a
Selenium	µg/L	a	a	a	a	a	a	3.0	a	a
Si as SiO ₂	µg/L	285.0	409.0	390.0	342.0	308.0	417.0	91.0	182.0	338.0
Strontium	µg/L	47	1060	127	202	222	877	b	49	88
Thallium	µg/L	a	a	a	7	a	a	a	a	a
Zinc	µg/L	374	a	75	29000	213	2800	1970	1100	93
Total Iron	µg/L	890	57	34000	220000	7300	716	630	218000	44000

a Not detected.

b Not tested for.

TEMPERATURE RECORDINGS OF COSO HOT SPRINGS AREA WELLS

The temperature logs from wells 4K-1, 4P-1, Schober's Well (4A-4), and Coso No. 1 are graphed in Figure 22, with the data listed in Tables 7 through 10. These data were recorded using the TD Probe System, manufactured by Natural Progress Instruments, Dallas, Texas.

TABLE 7. Temperature Recordings at Well 4K-1.

Depth, ft	Elevation, ft AMSL	Temperature °F	
		on 06/14/95	on 09/13/95
0	3658	204.8	205.5
-5	3653	204.8	205.5
-10	3648	204.8	205.5
-15	3643	204.8	205.5
-20	3638	204.8	205.5
-25	3633	204.8	205.5
-30	3628	204.8	205.5
-35	3623	204.8	205.5
-40	3618	204.8	205.5
-45	3613	204.8	205.5
-50	3608	205.3	205.5
-51	3607		205.5
-52	3606		206
-53	3605		207.9
-54	3604		208.9
-55	3603	208.9	208.9
-60	3598	209.3	211
-65	3593	209.8	211
-70	3588	210.4	211
-75	3583	210.7	212.1
-80	3578	210.9	212.1
-82.7	3575.3	211.1	

NAWS-CL TP 007

TABLE 8. Temperature Recordings at Well 4P-1.

Depth, ft	Elevation, ft AMSL	Temperature °F	
		on 06/14/95	on 09/13/95
0	3662	192.7	205.8
-5	3657	205.3	205.8
-10	3652	205.3	205.8
-15	3647	205.3	205.8
-20	3642	205.3	205.8
-25	3637	205.3	205.8
-30	3632	205.3	205.8
-35	3627	205.3	205.8
-40	3622	205.3	205.8
-45	3617	205.3	205.8
-50	3612	205.3	205.8
-51	3611		205.8
-52	3610		206.9
-53	3609		207.9
-54	3608		207.9
-55	3607	209.3	208.9
-56	3606		211
-57	3605		211
-58	3604		212.1
-59	3603		212.1
-60	3602	213.8	213.2
-65	3597	218.8	219
-70	3592	221.5	222.8
-75	3587	221.9	223
-80	3582	223.7	224.2
-85	3577	226.4	225.5
-90	3572	229.5	227.5
-95	3567	234.3	234.7
-100	3562	244.4	239
-100.7	3561.3	246	
-102	3560		243.7
-105	3557		249.9

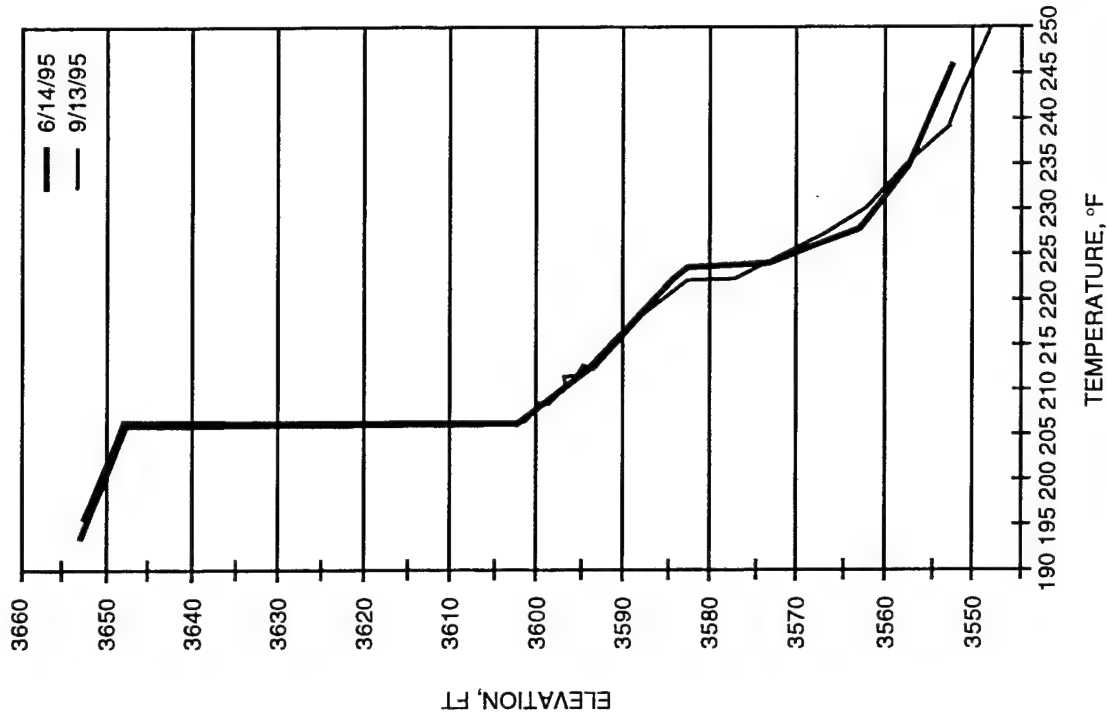
TABLE 9. Temperature Recordings at Well 4A-4.

Depth, ft	Elevation, ft AMSL	Temperature °F	
		on 06/14/95	on 09/13/95
0	3610	205.3	205.6
-5	3605	205.3	205.6
-10	3600	205.3	205.6
-15	3595	205.3	205.6
-20	3590	206.4	206.8
-25	3585	207.1	207.2
-27	3583	211.3	211.4
-30	3580	212.4	212.2

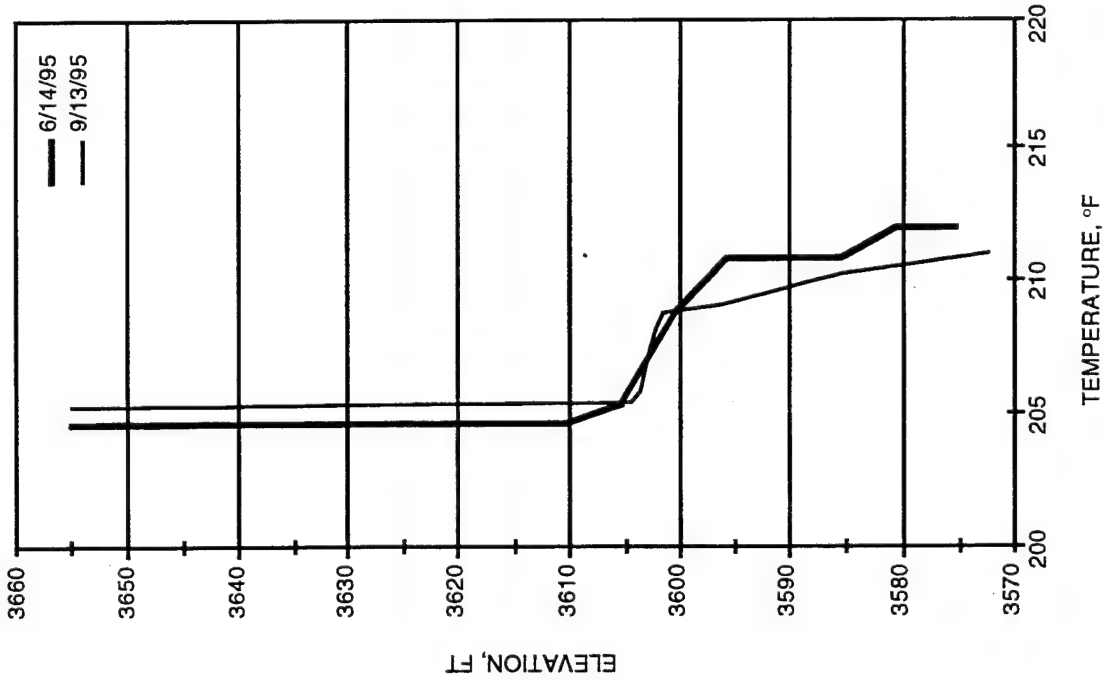
NAWS-CL TP 007

TABLE 10. Temperature Recordings at Coso No. 1.

Depth, ft	Elevation, ft AMSL	Temperature °F	
		on 03/03/95	on 09/13/95
5	3620	251	251.5
-5	3610	251	251.5
-15	3600	251.2	251.5
-25	3590	251.4	252
-35	3580	251.4	252
-45	3570	251.4	252
-55	3560	251.2	252
-65	3550	251.4	252
-75	3540	251.4	252.1
-85	3530	251.4	252.1
-95	3520	251.4	252.1
-105	3510	251.4	252.1
-115	3500	251.4	252.1
-125	3490	251.4	252.2
-135	32480	251.4	252.2
-145	3470	251.4	252.2
-155	3460	251.4	252.2
-165	3450	251.4	252.2
-175	3440	251.4	252.2
-185	3430	251.4	252.3
-195	3420	251.4	252.3
-205	3410	251.4	252.3
-215	3400	251.4	252.3
-225	3390	251.6	252.4
-235	3380	251.6	252.4
-245	3370	251.6	252.4
-255	3360	251.6	252.4
-265	3350	251.6	252.4
-275	3340	251.6	252.4
-285	3330	251.6	252.4
-295	3320	251.6	252.4
-300	3315	251.6	252.4
-305	3310	251.6	252.4
-310	3305	253.4	252.4
-315	3300	257.2	255.8
-318	3297		258.8
-319	3296		259
-320	3295	259.9	259.4
-321	3294		259.6
-322	3293		259.9
-323	3292		260
-324	3291		260.1
-325	3290	261.1	260.7
-326	3289		261
-330	3285	262.4	262
-335	3280	263.7	263.2
-340	3275	264.6	264.3
-345	3270	264.9	264.9
-349	3266	265.8	
-350	3265		265.8

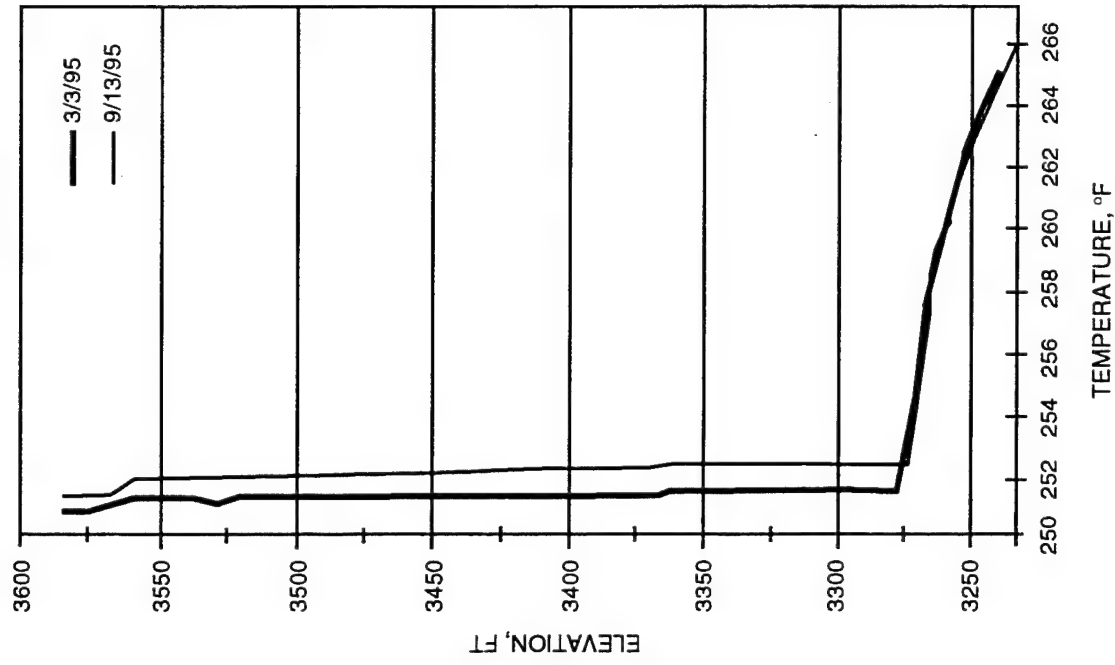


b. Well 4P-1 Temperature Gradient Logs.

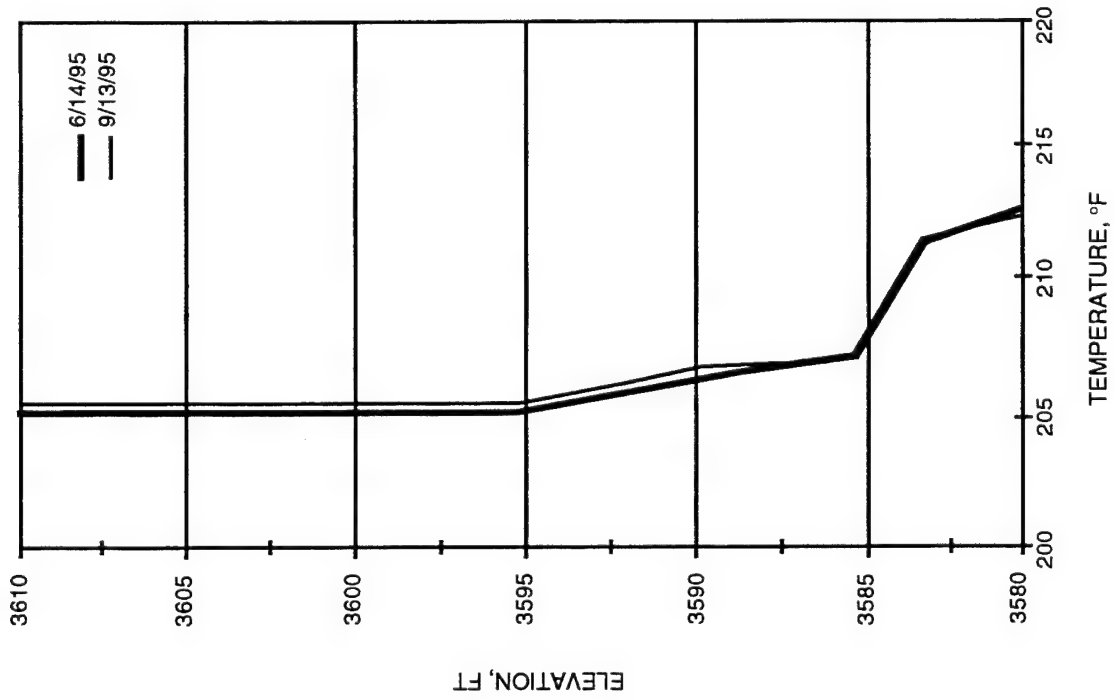


a. Well 4K-1 Temperature Gradient Logs.

FIGURE 22. Temperature Profiles.



d. Coso No. 1 Temperature Gradient Logs



c. Well 4A-4 Temperature Gradient Logs.

FIGURE 22. (Contd.)

OTHER GEOTHERMAL ACTIVITY AT COSO HOT SPRINGS

WEST CANYONS

These two canyons are located west of the Coso Resort and run perpendicular to the strike of the Coso Hot Springs fault.

The southerly canyon is directly below rain station No. 2 and includes both thermal features in the canyon and a wide area at the mouth of the canyon of hydrothermal alteration and scattered thermal activity. There is substantial evidence of a long history of thermal activity in the canyon, as well as historic utilization of these thermal features. The principle area of activity in the canyon consists of an active steam vent bordering an actively boiling pool. Further up the canyon are two small steam vents, small springs, and fossil hot spring terrace deposits. Thermal activity in these areas is sporadic, depending upon climatic conditions. No significant changes in the level of thermal activity has occurred in the southerly west canyon during this reporting period.

The northerly west canyon holds a wide area of hydrothermal alteration and fossil hot springs deposits, but current thermal activity is limited to warm-to-hot ground with a few small steam vents. The ground slump, first noted in NAWS-CL TP 001, has continued to stabilize during the past year. Much of the slump area is warm to hot, with steam emanating from a number of places—particularly along the front of the slump. In addition, several small pools of mud and steam condensate have developed on hot ground directly west of the slump.

Overall, these sites appear to be stable with some evidence of cooling. A large area near the mouth of the northerly canyon had heated in recent years to as high as 140°F, seemingly killing all vegetation. Much of this area has now cooled (85 to 65°F) and some of the deep-rooted creosote brush which had appeared dead is again growing. This cooling trend is in evidence elsewhere around the hot springs area.

NICHOL PROSPECT

The Nichol Prospect, a small mercury mine operated in the 1920s, is located midway between Devils Kitchen and Coso Hot Springs. As reported last year, hot water was observed in the 54-foot-deep shaft in October 1993 (Reference 1). However, in October 1994 the shaft began to dry out. A water sample was recovered on 15 March 1995 by bailing the bottom of the shaft, but the well is now dry. We will sound the well occasionally to check for water, but the well is not presently usable as a monitoring site.

A warm pool (Nichol Pool) is also present at the Nichol Prospect, on the north side of the Coso Road adjacent to a mercury prospect tunnel. Figures 13 and 14 show two views of the pool, taken about eleven months apart. The temperature of the warm pool fluctuates between approximately 95 to 135°F, while the water level changes only an inch or two throughout the year. In last year's report (Reference 1), we erroneously reported that Nichol Prospect water samples were taken from the mine shaft. They were actually taken from Nichol Pool. A comparison of this year's Nichol analyses with those of the past two years (Table 11) shows clear continuity in the chemical make-up of this water. The Nichol Pool is the only thermal pool in the Coso Hot Springs

area which has remained consistently clear throughout its history. This lack of turbidity is probably due to the low activity level of the pool, i.e., little influx of live steam or non-condensable gases.

TABLE 11. Chemical Analysis of Nichol Prospect Thermal Waters
Comparing 1993, 1994, and 1995 Water Testing.

Constituents	Units	Nichol 03/23/ 1993	Nichol 07/09 1993	Nichol 12/29 1993	Nichol 04/13 1994	Nichol 08/30 1994	Nichol Pool 03/15 1995	Nichol Shaft 03/15 1995
Calcium	mg/L	39.0	31.0	44.0	41.0	47.0	60.0	102.0
Magnesium	mg/L	12.1	9.6	11.2	10.0	10.2	12.7	31.0
Sodium	mg/L	624.0	510.0	707.0	780.0	801.0	757.0	66.0
Potassium	mg/L	68.0	87.0	99.0	99.0	105.0	112.0	33.0
Carbonate	mg/L	a	a	a	a	a	a	a
Bicarbonate	mg/L	a	a	a	a	a	a	a
Chloride	mg/L	1100.0	955.0	1340.0	1320.0	1400.0	1330.0	104.0
Sulfate	mg/L	390	685	410	166	395	540	1180
Fluoride	mg/L	0.42	0.32	0.22	0.21	0.19	0.21	1.20
Bromide	mg/L	2.2	1.8	2.5	2.4	2.8	2.2	0.3
pH	pH units	2.4	2.2	2.7	2.4	2.4	2.3	2.6
Electrical Conductivity	umhos/ cm	5900	6600	6480	6100	6150	16500	3000
Total Dissolved Solids	mg/L	2540	2380	3100	3060	3150	3170	2320
Total Acidity	mg/L	8.7	12.5	8.1	10.1	a	7.0	16.0
Aluminum	µg/L	13200	16100	7090	5170	4120	6000	16000
Antimony	µg/L	a	a	a	a	a	a	a
Arsenic	µg/L	505.0	588.0	764.0	768.0	1240.0	980.0	40.0
Boron	µg/L	24.0	20.0	28.0	30.0	30.0	32.0	1.8
Copper	µg/L	a	a	a	a	23	23	a
Lithium	µg/L	970	1280	612	2590	3340	3520	79
Manganese	µg/L	1550	1290	1440	1470	1310	2000	1800
Mercury	µg/L	27.0	53.0	43.0	4.8	4.5	7.5	a
Selenium	µg/L	a	a	a	a	a	a	a
Si as SiO ₂	µg/L	364.0	302.0	365.0	366.0	360.0	390.0	342.0
Strontium	µg/L	50	66	76	89	110	127	202
Thallium	µg/L	7.1	5.7	5.7	6.0	6.9	a	6.8
Zinc	µg/L	103	109	87	76	100	75	29000
Total Iron	µg/L	38600	34100	31000	31000	33300	34000	220000

^a None detected.

SUMMARY AND DISCUSSION

The data recovered from each of the steam flow monitoring sites: Devils Kitchen, Well 4H-4, and Schober's Resort are considerably less erratic this year than the data recovered in the past several years. Several factors have contributed to this increased stability. A formal periodic maintenance schedule, including yearly calibration and maintenance by an ITT Barton technician, is well established. The new digital steam flow recording equipment, the ITT Barton ADScan, has been installed at the three steam wells. Some repiping between the meters and the steam lines was also done this year to conform to ITT Barton's current technical specifications. This increased stability indicates that previously unrecognized surface effects in the piping and/or meter instability had contributed to data fluctuations in recent years.

The water level in well 4P-1 slowly continues to rise—about 20 feet since the beginning of the monitoring program in 1978. Most of this water level rise has occurred since 1989. The water in this well is predominately a steam condensate and probably represents a small perched water table. The water level rise, combined with a slight increase in bottom hole temperature in the well, appears to indicate that there has been an influx of steam into this area in the past few years.

In contrast to well 4P-1, the water level in wells OB-1 and Coso No. 1 continues to drop. Well OB-1 is located adjacent to the south side of Coso Wash and is clearly set in valley fill sediments, so it is unclear why the level has dropped some 40 feet since 1988. While water analyses indicate a partial geothermal fluid component, the predominant water source is clearly inflow of meteoric water from the mountains to the north and east. The groundwater around well OB-1 may still be responding to relatively low rainfall conditions in the region from 1985 through 1990, or the groundwater may just be seeking equilibrium with groundwater on the north side of the wash (represented by well OB-2).

As discussed in previous monitoring reports, the water level in Coso No. 1 is clearly influenced by the thermal activity along the hot springs fault. The level has dropped about 175 feet since 1984 due to a significant influx of heat and boiling off of water. Since the wellhead was repaired and the well shut in, the water level appears to have stabilized.

There has been no significant change in thermal activity at the South Pool this past year. The water level continues to fluctuate seasonally, as does the water temperature, which exhibits about a ten degree (F) seasonal variation.

Additional observations:

During this reporting period, the central Coso Fault thermal area has remained very stable. The thermal area includes the old corrosion array, the Coso Resort mudfield, the South Pool, and the smaller pool and pots in between. No new mud pots have appeared here and the existing mud pots, craters and fumaroles have not changed in appearance. Only the fault line area just south of the South Pool and the southerly West Canyon pools have become somewhat more active.

There has been a decline in near-surface ground temperatures at hot spots both around the Upper Coso Wash Valley and along the periphery of the Coso Fault system. (A hot spot is identified by warm-to-hot near-surface temperatures, discolored (cooked) soil, and/or die-off of vegetation.) The shallow-rooted grasses and scrub that grew in these hot spots are returning, as are many deep-rooted creosote bushes that once appeared to be dead. Not all creosotes are coming

back, but a significant percentage of those that grew on the periphery of the hot spots (where the ground temperatures never exceeded about 175°F), are recovering. Some specific vegetation recovery areas are: along the fault line north of Schober's Resort, in the northerly west canyon, around and south of well 4P-1, and in several areas in the valley east of Schober's Resort.

This year's data, particularly that from the surface pools, pots, fumaroles, and hot spots, indicate that a slight cooling trend may be occurring in the Coso Hot Springs area, although it is not possible to draw a clear conclusion yet from these data. At a minimum, the overall balance of the level of thermal activity throughout the hot springs area this past year continues to indicate that there is a finite amount of heat/steam entering the area. Continuance of this monitoring program may enable us to clarify this trend over the next year or two.

REFERENCES

1. Naval Air Weapons Station. *Coso Monitoring Program, October 1993 Through September 1994*, by S. C. Bjornstad, Public Works Department, J. H. Monahan, J. K. Sprouse and D. M. White, Comarco Weapons Support Division, Ridgecrest, Calif. China Lake, Calif., NAWS-CL, January 1995. 106 pp. (NAWS-CL TP 006, publication UNCLASSIFIED.)
2. _____. *Coso Monitoring Program, October 1991 Through September 1992*, by J. H. Monahan and K. L. Larson, Comarco Weapons Support Division, Ridgecrest, Calif. China Lake, Calif., NAWS-CL, December 1992. 123 pp. (NAWS-CL TP 001, publication UNCLASSIFIED.)

Appendix
DAILY STEAM FLOW

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TABLE A-1. Devils Kitchen Steam Flow.

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
01-Oct-94	507.3	476.1	489.1	15-Nov-94	450.9	424.2	437.1
02-Oct-94				16-Nov-94	458.1	438.9	449.1
03-Oct-94				17-Nov-94	470.5	435.3	452.5
04-Oct-94				18-Nov-94	455.9	431.3	445.8
05-Oct-94				19-Nov-94	451.1	405.9	430.2
06-Oct-94				20-Nov-94	445.7	409.2	429.4
07-Oct-94				21-Nov-94	457.5	434.7	445.5
08-Oct-94				22-Nov-94	454.1	438.3	445.0
09-Oct-94				23-Nov-94	449.4	429.4	437.4
10-Oct-94				24-Nov-94	507.7	430.0	462.3
11-Oct-94				25-Nov-94	523.9	505.3	514.9
12-Oct-94				26-Nov-94	526.9	510.9	521.2
13-Oct-94	464.9	436.4	455.8	27-Nov-94	534.5	485.8	511.1
14-Oct-94	464.5	449.8	454.6	28-Nov-94	524.7	490.3	508.1
15-Oct-94	480.3	451.4	464.0	29-Nov-94	520.7	504.5	512.1
16-Oct-94	462.1	442.7	454.1	30-Nov-94	509.4	468.3	489.8
17-Oct-94	455.9	434.0	443.4	01-Dec-94	495.3	474.2	483.2
18-Oct-94	464.8	439.5	449.7	02-Dec-94	504.7	482.6	493.4
19-Oct-94	456.7	446.4	449.4	03-Dec-94	500.6	482.3	493.0
20-Oct-94	457.4	445.3	450.8	04-Dec-94	494.7	483.8	488.3
21-Oct-94	457.1	443.9	448.9	05-Dec-94	492.8	481.1	488.3
22-Oct-94	465.6	445.6	453.5	06-Dec-94	501.4	484.8	492.3
23-Oct-94	464.1	451.4	457.7	07-Dec-94	494.4	466.4	476.9
24-Oct-94	462.5	450.8	456.4	08-Dec-94	474.3	453.1	466.7
25-Oct-94	464.5	452.3	457.6	09-Dec-94	471.4	450.0	461.3
26-Oct-94	462.0	454.3	457.9	10-Dec-94	478.8	456.6	470.7
27-Oct-94	458.3	448.9	454.0	11-Dec-94	498.5	460.7	482.8
28-Oct-94	460.9	449.2	455.9	12-Dec-94	494.5	479.9	486.4
29-Oct-94	465.4	453.7	459.2	13-Dec-94	497.6	476.4	488.7
30-Oct-94	464.1	452.5	458.7	14-Dec-94	485.6	461.6	473.9
31-Oct-94	458.0	443.2	450.1	15-Dec-94	485.5	459.8	472.0
01-Nov-94	460.2	441.0	449.9	16-Dec-94	474.0	458.1	466.3
02-Nov-94	479.3	454.7	463.9	17-Dec-94	473.8	459.4	464.5
03-Nov-94	462.6	445.3	457.3	18-Dec-94	478.2	462.0	469.2
04-Nov-94	444.4	426.2	436.1	19-Dec-94	482.2	459.2	471.7
05-Nov-94	452.9	426.0	439.6	20-Dec-94	466.8	455.2	460.4
06-Nov-94	460.2	440.7	451.1	21-Dec-94	465.7	456.5	461.3
07-Nov-94	463.2	448.1	454.3	22-Dec-94	484.6	461.6	470.8
08-Nov-94	460.9	446.4	453.9	23-Dec-94	468.9	455.1	463.0
09-Nov-94	456.5	442.5	447.8	24-Dec-94	467.8	446.7	454.2
10-Nov-94	466.4	445.7	453.5	25-Dec-94	470.5	443.2	456.4
11-Nov-94	458.5	444.4	452.3	26-Dec-94	473.8	453.9	461.2
12-Nov-94	457.7	437.8	446.8	27-Dec-94	477.4	457.7	467.8
13-Nov-94	457.6	441.5	449.1	28-Dec-94	474.9	453.0	463.8
14-Nov-94	452.2	427.1	436.0	29-Dec-94	470.4	451.8	459.2

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TABLE A-1. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
30-Dec-94	477.2	453.7	464.4	08-Mar-95	494.4	479.3	490.2
31-Dec-94	488.0	466.1	474.1	09-Mar-95	509.0	487.1	497.1
01-Jan-95	480.5	466.0	471.5	10-Mar-95	519.4	496.0	504.7
02-Jan-95	473.1	434.5	457.0	11-Mar-95	506.8	501.9	503.8
03-Jan-95	465.3	441.0	452.0				
04-Jan-95	465.2	417.3	449.7	22-Mar-95	496.4	472.9	486.6
05-Jan-95	514.4	449.6	488.4	23-Mar-95	487.5	467.9	478.4
				24-Mar-95	497.7	482.1	489.3
16-Jan-95	448.6	418.2	431.8	31-Mar-95	488.5	473.6	477.9
17-Jan-95	459.0	437.7	444.1				
18-Jan-95	444.5	428.6	435.3	01-Apr-95	503.6	475.0	488.0
19-Jan-95	454.9	426.1	441.5	02-Apr-95	500.0	476.2	481.4
20-Jan-95	477.3	451.1	463.8				
21-Jan-95	480.4	462.9	472.0	06-Apr-95	515.7	493.3	504.5
22-Jan-95	479.9	463.4	469.4	07-Apr-95	510.8	487.0	497.9
23-Jan-95	476.6	456.9	466.7	08-Apr-95	505.2	488.4	495.3
24-Jan-95	482.0	467.5	473.4	09-Apr-95	505.6	490.7	496.1
25-Jan-95	460.2	453.3	456.8	10-Apr-95	495.5	470.5	485.4
06-Feb-95	418.9	348.1	376.3	11-Apr-95	493.6	468.8	482.1
				12-Apr-95	489.6	479.3	484.9
07-Feb-95	431.9	369.0	396.8	13-Apr-95	491.0	481.8	484.8
08-Feb-95	422.0	386.6	398.2	14-Apr-95	508.5	480.1	487.3
09-Feb-95	419.0	385.0	401.6	15-Apr-95	501.2	473.4	486.7
10-Feb-95	397.5	361.9	382.5	16-Apr-95	517.1	492.1	504.9
11-Feb-95	422.0	373.5	393.0	17-Apr-95	513.2	481.4	495.1
12-Feb-95	419.9	380.0	396.9	18-Apr-95	505.0	478.6	489.0
13-Feb-95	424.8	363.2	395.1	19-Apr-95	502.1	490.0	498.8
14-Feb-95	377.5	373.2	375.4	20-Apr-95	489.2	478.6	484.6
18-Feb-95	474.2	454.5	467.5	26-Apr-95	505.0	485.9	493.5
19-Feb-95	499.6	473.5	485.6	27-Apr-95	505.0	486.1	492.8
20-Feb-95	506.3	486.2	495.0	28-Apr-95	499.4	487.7	491.4
21-Feb-95	522.8	501.4	511.0	29-Apr-95	509.4	489.6	496.9
22-Feb-95	515.8	498.5	507.3	30-Apr-95	507.0	482.6	496.7
23-Feb-95	512.7	482.8	497.0	01-May-95	494.4	484.9	489.2
24-Feb-95	508.4	487.6	496.1	02-May-95	502.1	490.7	497.8
25-Feb-95	510.0	494.9	501.9	03-May-95	502.1	490.7	498.8
26-Feb-95	518.7	500.5	510.9	04-May-95	507.8	485.0	495.0
27-Feb-95	508.9	493.7	500.7	05-May-95	525.0	502.1	511.2
28-Feb-95	514.9	498.8	505.2	06-May-95	513.5	502.1	509.3
01-Mar-95	509.8	495.5	503.8	07-May-95	502.1	490.7	495.9
02-Mar-95	512.3	491.6	501.4	08-May-95	502.1	496.4	499.3
03-Mar-95	501.9	491.5	496.3	09-May-95	502.1	485.0	494.5
04-Mar-95	513.9	486.3	501.6	10-May-95	513.5	485.0	494.5
05-Mar-95	491.4	471.3	479.5	11-May-95	517.1	503.7	509.6

TABLE A-1. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
12-May-95	534.7	511.1	518.9	25-June-95	509.8	490.5	498.3
13-May-95	528.3	506.1	516.9	26-June-95	507.6	496.5	501.2
14-May-95	521.9	488.4	511.6	27-June-95	503.2	469.3	495.1
15-May-95	501.6	484.3	491.0	28-June-95	496.8	487.2	492.0
16-May-95	506.1	485.5	493.6	29-June-95	509.2	491.5	496.7
17-May-95	512.6	501.2	507.6	30-June-95	505.7	485.2	494.8
18-May-95	509.5	489.3	495.5	01-Jul-95	504.0	485.2	492.4
19-May-95	502.5	489.3	494.1	02-Jul-95	501.8	487.9	494.3
20-May-95	512.0	494.9	500.9	03-Jul-95	504.3	487.4	493.3
21-May-95	514.0	502.5	505.5	04-Jul-95	508.0	492.3	498.0
22-May-95	516.2	503.0	507.7	05-Jul-95	497.0	484.0	490.5
23-May-95	514.2	499.4	508.8	06-Jul-95	497.1	483.8	488.7
24-May-95	501.2	496.5	499.5	07-Jul-95	498.7	484.6	489.7
25-May-95	505.9	496.7	501.6	08-Jul-95	500.5	483.3	488.5
26-May-95	502.3	491.3	498.1	09-Jul-95	499.4	486.6	491.8
27-May-95	498.7	489.3	494.3	10-Jul-95	498.8	488.3	493.2
28-May-95	493.9	492.5	493.3	11-Jul-95	496.8	489.6	494.0
28-May-95	500.4	493.6	495.7	12-Jul-95	505.9	484.8	492.7
29-May-95	499.8	492.6	495.6	13-Jul-95	502.8	488.2	494.2
30-May-95	502.9	491.3	496.8	14-Jul-95	497.8	482.2	489.3
31-May-95	508.3	489.9	495.8	15-Jul-95	497.9	483.4	489.0
01-June-95	502.2	493.6	497.4	16-Jul-95	499.6	485.5	490.3
02-June-95	523.3	500.9	509.5	17-Jul-95	489.7	480.1	486.2
03-June-95	513.5	499.1	505.7	18-Jul-95	501.9	484.0	490.1
04-June-95	501.6	490.1	494.5	19-Jul-95	501.3	485.3	491.6
05-June-95	505.2	490.0	496.5	20-Jul-95	495.8	483.3	488.6
06-June-95	515.8	488.2	503.7	21-Jul-95	501.0	485.2	490.8
07-June-95	529.8	484.5	502.0	22-Jul-95	503.9	487.1	493.1
08-June-95	503.0	484.5	495.4	23-Jul-95	501.1	486.7	492.4
09-June-95	489.8	485.5	487.6	24-Jul-95	497.3	485.2	490.1
10-June-95	487.0	480.0	483.5	25-Jul-95	501.5	486.6	492.4
11-June-95	497.1	481.0	486.9	26-Jul-95	501.5	487.7	494.7
12-June-95	503.5	490.8	495.4	27-Jul-95	496.6	485.0	490.1
13-June-95	506.8	493.2	497.9	28-Jul-95	495.9	483.7	487.8
14-June-95	508.7	494.2	499.8	29-Jul-95	499.9	483.9	488.8
15-June-95	507.0	496.8	501.8	30-Jul-95	498.6	487.5	491.9
16-June-95	513.7	502.0	506.6	31-Jul-95	504.8	491.1	496.1
17-June-95	502.7	477.0	491.4	01-Aug-95	499.3	484.7	490.2
18-June-95	486.1	475.5	479.7	02-Aug-95	501.2	481.5	490.9
19-June-95	503.9	481.0	490.2	03-Aug-95	508.3	487.1	495.8
20-June-95	506.5	490.4	496.3	04-Aug-95	507.6	486.9	497.0
21-June-95	503.9	487.0	496.7	05-Aug-95	516.4	486.1	497.7
22-June-95	497.4	482.5	489.3	06-Aug-95	517.4	496.7	503.9
23-June-95	496.0	484.4	489.1	07-Aug-95	506.3	490.3	498.4
24-June-95	499.7	482.9	490.5	08-Aug-95	510.9	491.0	499.9

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TABLE A-1. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
09-Aug-95	518.9	489.7	503.6	08-Sep-95	501.6	468.9	477.9
10-Aug-95	524.0	502.2	510.0	09-Sep-95	498.4	474.2	481.7
11-Aug-95	512.1	496.3	506.0	10-Sep-95	493.1	470.5	478.8
12-Aug-95	505.7	489.7	497.2	11-Sep-95	484.5	462.4	471.6
13-Aug-95	511.9	485.7	495.8	12-Sep-95	483.0	456.0	469.5
14-Aug-95	521.6	492.0	503.7	13-Sep-95	490.5	464.4	476.3
15-Aug-95	515.5	495.7	503.8	14-Sep-95	496.9	472.8	483.5
16-Aug-95	518.6	486.4	502.1	15-Sep-95	498.3	477.1	486.1
17-Aug-95	515.0	492.6	501.2	16-Sep-95	500.8	477.7	487.0
18-Aug-95	517.4	490.3	498.5	17-Sep-95	479.3	470.1	476.5
19-Aug-95	498.7	473.9	488.0	17-Sep-95	490.2	469.0	478.8
20-Aug-95	506.6	485.8	493.3	18-Sep-95	502.1	471.8	483.2
21-Aug-95	493.1	476.5	485.4	19-Sep-95	508.3	475.0	488.2
22-Aug-95	493.1	474.1	481.0	20-Sep-95	511.8	481.5	496.4
23-Aug-95	504.0	477.4	488.8	21-Sep-95	523.5	493.1	504.4
24-Aug-95	503.7	488.4	494.1	22-Sep-95	518.6	494.9	504.5
25-Aug-95	504.2	482.6	491.4	23-Sep-95	520.7	494.3	504.4
26-Aug-95	501.4	481.9	488.9	24-Sep-95	515.0	491.9	501.0
27-Aug-95	499.1	479.3	486.6	25-Sep-95	505.9	488.1	495.3
28-Aug-95	495.8	476.4	483.4	26-Sep-95	521.5	491.6	504.9
29-Aug-95	489.8	476.9	481.9	27-Sep-95	510.8	492.6	501.3
30-Aug-95	498.7	474.5	483.8	28-Sep-95	502.8	483.4	491.8
31-Aug-95	498.6	480.3	486.2	29-Sep-95	509.6	486.6	496.5
01-Sep-95	494.3	471.0	481.8	30-Sep-95	497.7	471.5	483.7
02-Sep-95	494.0	472.6	481.5				
03-Sep-95	496.0	468.6	476.2				
04-Sep-95	495.7	469.1	477.0				
05-Sep-95	484.6	467.4	475.3				
06-Sep-95	482.0	455.5	468.6				
07-Sep-95	492.4	463.0	472.2				

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TABLE A-2. 4H-4 Steam Flow.

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
01-Oct-94				15-Nov-94	299.9	268.3	285.0
02-Oct-94	351.2	333.3	340.4	16-Nov-94	324.6	270.2	302.5
03-Oct-94	375.1	337.3	351.6	17-Nov-94	313.3	256.6	287.6
04-Oct-94	376.1	345.4	366.0	18-Nov-94	299.7	254.0	279.9
05-Oct-94	340.4	315.6	328.1	19-Nov-94	297.0	238.5	267.5
06-Oct-94	339.8	318.3	331.2	20-Nov-94	246.5	232.2	239.7
07-Oct-94	335.9	316.1	325.3	21-Nov-94	275.9	230.4	257.1
08-Oct-94	320.8	297.1	309.3	22-Nov-94	273.2	241.0	259.5
09-Oct-94	336.0	304.5	316.1	23-Nov-94	235.2	225.8	230.0
10-Oct-94	352.2	323.3	334.2	24-Nov-94	264.8	225.3	247.9
11-Oct-94	362.5	338.8	349.1	25-Nov-94	292.1	256.3	275.5
12-Oct-94	355.2	343.0	350.3	26-Nov-94	299.5	282.3	289.0
13-Oct-94	379.2	339.5	358.9	27-Nov-94	304.4	222.8	273.4
14-Oct-94	369.3	349.8	359.0	28-Nov-94	261.3	225.6	242.2
15-Oct-94	384.4	350.7	363.5	29-Nov-94	262.6	238.5	249.9
16-Oct-94	367.1	308.7	339.2	30-Nov-94	308.0	232.6	265.6
17-Oct-94	311.4	280.6	299.2	01-Dec-94	334.5	297.6	318.8
18-Oct-94	323.7	296.1	308.1	02-Dec-94	353.3	329.9	341.6
19-Oct-94	346.6	315.3	330.1	03-Dec-94	353.4	340.0	345.2
20-Oct-94	337.5	320.9	330.7	04-Dec-94	349.0	327.2	337.3
21-Oct-94	339.8	322.2	327.2	05-Dec-94	342.1	324.9	331.1
22-Oct-94	345.8	320.5	332.3	06-Dec-94	352.9	320.0	335.7
23-Oct-94	356.9	338.5	345.6	07-Dec-94	335.7	314.6	320.8
24-Oct-94	339.9	328.9	335.8	08-Dec-94	313.5	287.5	300.4
25-Oct-94	347.8	332.5	340.8	09-Dec-94	297.9	275.2	285.5
26-Oct-94	359.1	334.8	347.1	10-Dec-94	318.3	299.9	308.8
27-Oct-94	345.8	325.4	338.2	11-Dec-94	354.2	304.4	329.1
28-Oct-94	350.2	324.1	335.8	12-Dec-94	352.8	319.5	331.8
29-Oct-94	373.5	344.6	359.6	13-Dec-94	351.7	323.3	337.8
30-Oct-94	365.4	345.8	356.6	14-Dec-94	340.1	305.3	325.5
31-Oct-94	342.3	316.8	330.8	15-Dec-94	328.2	301.2	312.5
01-Nov-94	346.4	309.9	325.2	16-Dec-94	322.5	300.8	310.0
02-Nov-94	410.0	343.9	379.4	17-Dec-94	317.3	293.9	304.5
03-Nov-94	403.6	351.4	383.3	18-Dec-94	327.4	305.0	318.4
04-Nov-94	347.0	308.6	326.9	19-Dec-94	338.8	312.4	328.9
05-Nov-94	334.8	307.3	318.3	20-Dec-94	317.6	304.4	310.8
06-Nov-94	359.1	332.4	343.0	21-Dec-94	329.1	307.1	317.4
07-Nov-94	361.8	338.1	350.4	22-Dec-94	333.4	310.9	319.6
08-Nov-94	360.5	344.0	353.6	23-Dec-94	339.5	315.3	325.9
09-Nov-94	347.5	321.2	332.3	24-Dec-94	353.4	319.3	337.5
10-Nov-94	349.5	322.7	334.2	25-Dec-94	343.4	323.7	335.1
11-Nov-94	360.4	319.1	344.7	26-Dec-94	341.6	297.1	323.4
12-Nov-94	340.7	318.8	326.8	27-Dec-94	309.1	293.9	301.8
13-Nov-94	342.3	304.6	328.1	28-Dec-94	340.8	305.8	311.1
14-Nov-94	290.4	266.2	275.7	29-Dec-94	350.6	324.6	337.5

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TABLE A-2. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
30-Dec-94	348.6	321.8	332.7	13-Feb-95	392.4	356.0	380.6
31-Dec-94	318.8	303.6	312.7	14-Feb-95	361.6	356.4	358.8
01-Jan-95	312.6	303.2	309.0				
02-Jan-95	320.1	298.7	311.7	18-Feb-95	334.4	324.6	331.2
03-Jan-95	339.3	312.4	326.6	19-Feb-95	338.1	322.3	329.5
04-Jan-95	337.8	325.1	329.4	20-Feb-95	340.4	320.2	330.0
05-Jan-95	381.7	325.0	348.0	21-Feb-95	370.3	335.1	349.2
06-Jan-95	397.0	314.9	359.2	22-Feb-95	353.2	345.8	349.6
07-Jan-95	315.3	301.2	310.3	23-Feb-95	343.1	321.3	334.1
08-Jan-95	331.7	308.3	321.7	24-Feb-95	327.7	313.3	320.9
09-Jan-95	323.5	312.6	316.8	25-Feb-95	340.7	317.0	327.1
10-Jan-95	352.9	316.0	337.7	26-Feb-95	359.3	335.7	345.7
11-Jan-95	362.7	348.3	357.2	27-Feb-95	347.2	328.8	340.2
12-Jan-95	355.7	326.0	344.9	28-Feb-95	341.1	330.2	336.1
13-Jan-95	339.9	316.2	331.5	01-Mar-95	350.0	324.3	336.3
14-Jan-95	338.8	307.2	325.4	02-Mar-95	378.9	350.3	361.5
15-Jan-95	372.7	331.8	351.6	03-Mar-95	361.1	339.0	352.5
16-Jan-95	370.7	343.8	360.5	04-Mar-95	361.1	339.3	346.9
17-Jan-95	343.0	324.2	334.9	05-Mar-95	337.5	320.0	327.8
18-Jan-95	329.1	301.5	313.4	06-Mar-95	353.6	323.8	340.5
19-Jan-95	305.3	298.1	303.1	07-Mar-95	309.3	283.2	293.3
20-Jan-95	338.6	307.7	323.9	08-Mar-95	303.1	290.1	296.4
21-Jan-95	338.0	330.8	334.0	09-Mar-95	325.4	297.4	311.5
22-Jan-95	338.6	313.4	326.2	#####	348.5	315.3	329.6
23-Jan-95	329.1	312.5	319.9	#####	355.8	325.3	336.5
24-Jan-95	353.2	321.2	336.1	#####	330.1	324.3	326.3
25-Jan-95	350.8	326.0	340.6	#####	348.1	328.6	336.1
26-Jan-95	342.4	324.3	332.7	#####	355.7	328.0	342.3
27-Jan-95	325.5	302.3	312.6	#####	335.4	303.4	321.5
28-Jan-95	306.4	294.5	301.1				
				#####	353.7	309.8	329.8
29-Jan-95	323.0	294.8	306.1	#####	357.1	329.6	343.6
30-Jan-95	332.9	307.5	319.4	#####	367.0	348.5	357.2
31-Jan-95	333.9	313.8	325.7	#####	366.3	327.0	356.4
01-Feb-95	343.8	330.8	336.2	#####	329.9	306.6	316.0
02-Feb-95	353.7	324.1	335.1				
				#####	352.7	297.9	334.1
03-Feb-95	329.1	309.6	322.6	#####	304.4	285.6	293.9
04-Feb-95	322.0	310.0	315.4	#####	298.6	268.3	282.1
05-Feb-95	349.5	314.3	329.2	#####	287.5	264.6	273.3
06-Feb-95	363.8	333.6	348.4	#####	306.4	273.0	290.3
07-Feb-95	375.4	349.4	362.7				
				#####	310.7	296.5	302.6
08-Feb-95	386.4	374.9	379.1	#####	302.2	283.4	292.3
09-Feb-95	372.8	344.4	361.7	#####	295.0	267.9	281.9
10-Feb-95	346.0	330.5	336.5	01-Apr-95	295.5	269.0	281.5
11-Feb-95	369.3	332.4	351.9	02-Apr-95	331.0	290.5	304.9
12-Feb-95	398.4	360.9	377.3				

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TABLE A-2. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
03-Apr-95	296.0	271.2	288.6	#####	289.7	265.3	278.2
04-Apr-95	286.7	269.8	275.3	#####	290.5	263.8	273.8
05-Apr-95	308.1	275.4	293.6	#####	300.6	271.9	283.5
06-Apr-95	325.5	300.4	310.7	#####	306.8	284.7	291.6
07-Apr-95	317.1	291.7	305.1	#####	309.2	286.6	294.9
08-Apr-95	311.2	288.3	297.2	#####	309.5	286.6	298.8
09-Apr-95	312.4	284.6	296.4	#####	294.0	277.3	284.3
10-Apr-95	287.8	260.6	275.3	#####	297.9	277.7	286.5
11-Apr-95	294.2	258.2	272.2	#####	290.1	267.6	282.0
12-Apr-95	299.0	272.9	282.8	#####	290.5	267.2	275.5
13-Apr-95	293.8	273.0	283.0	#####	285.1	268.0	272.5
14-Apr-95	319.8	282.1	295.1	#####	294.0	269.6	277.4
15-Apr-95	309.4	262.6	288.0	#####	292.5	270.0	278.4
16-Apr-95	337.1	302.6	318.8	#####	289.8	268.4	276.8
17-Apr-95	319.1	283.4	303.5	01-Jun-95	285.5	271.9	279.0
18-Apr-95	284.5	265.8	275.5	02-Jun-95	322.5	284.0	301.7
19-Apr-95	313.3	280.6	298.2	03-Jun-95	306.9	285.6	297.7
20-Apr-95	293.4	269.1	284.8	04-Jun-95	288.7	265.4	277.1
21-Apr-95	313.4	266.6	287.0	05-Jun-95	289.1	263.1	273.7
22-Apr-95	274.1	253.2	263.5	06-Jun-95	317.5	267.4	291.6
23-Apr-95	283.3	248.4	263.8	07-Jun-95	305.8	265.8	287.4
24-Apr-95	300.5	253.9	275.5	08-Jun-95	296.9	272.8	282.9
25-Apr-95	314.7	282.5	298.8	09-Jun-95	273.2	247.9	266.7
26-Apr-95	319.8	297.6	306.0	10-Jun-95	264.0	245.6	252.0
27-Apr-95	312.0	277.4	294.7	11-Jun-95	278.7	247.9	260.0
28-Apr-95	312.0	283.6	298.6	12-Jun-95	291.9	265.9	275.9
29-Apr-95	305.6	281.3	287.6	13-Jun-95	298.2	273.3	281.6
30-Apr-95	323.5	271.0	290.9	14-Jun-95	305.6	278.0	288.4
01-May-95	284.2	273.2	277.3	15-Jun-95	301.3	283.4	292.1
02-May-95	308.1	282.2	293.5	16-Jun-95	322.3	297.0	304.9
03-May-95	300.3	278.5	292.5	17-Jun-95	298.2	248.4	277.1
04-May-95	301.9	267.6	283.4	18-Jun-95	274.9	246.1	255.4
05-May-95	326.6	295.9	308.4	19-Jun-95	296.7	257.2	273.0
06-May-95	315.0	295.6	306.5	20-Jun-95	303.0	279.2	287.3
07-May-95	297.1	289.0	292.5	21-Jun-95	301.0	272.3	289.0
08-May-95	300.2	273.0	292.9	22-Jun-95	283.2	260.7	270.1
09-May-95	283.5	264.9	272.9	23-Jun-95	277.7	260.7	266.7
#####	314.9	259.6	275.5	24-Jun-95	282.0	261.1	268.5
#####	305.3	280.4	290.1	25-Jun-95	299.2	268.8	281.2
#####	339.4	290.9	310.9	26-Jun-95	301.1	286.3	291.2
#####	335.2	308.8	317.9	27-Jun-95	294.5	271.2	283.4
#####	324.3	274.2	311.0	28-Jun-95	304.6	267.7	273.8
#####	278.1	261.5	269.0	29-Jun-95	298.0	270.8	281.2
#####	288.6	259.2	271.5	30-Jun-95	294.0	269.5	279.1
#####	307.6	283.1	295.5	01-Jul-95	290.5	266.8	276.0

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TABLE A-2. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
02-Jul-95	288.1	271.4	277.8	16-Aug-95	295.9	262.2	276.8
03-Jul-95	288.0	267.8	276.3	17-Aug-95	295.4	268.2	279.9
04-Jul-95	300.8	276.7	285.7	18-Aug-95	291.7	266.2	275.6
05-Jul-95	281.7	265.4	273.2	19-Aug-95	271.2	251.0	261.8
06-Jul-95	279.7	258.5	267.0	20-Aug-95	280.9	256.2	266.5
07-Jul-95	285.1	262.6	269.6	21-Aug-95	269.7	246.6	258.4
08-Jul-95	276.1	251.5	266.0	22-Aug-95	266.1	244.4	252.8
09-Jul-95	287.7	260.6	270.1	23-Aug-95	270.9	251.1	253.4
10-Jul-95	288.4	266.3	274.6	24-Aug-95	293.0	273.1	279.7
11-Jul-95	296.9	271.2	278.3	25-Aug-95	294.4	264.4	278.2
12-Jul-95	292.5	270.8	279.1	26-Aug-95	290.4	265.5	276.5
13-Jul-95	292.5	270.3	279.0	27-Aug-95	286.7	263.0	273.9
14-Jul-95	279.6	262.6	270.2	28-Aug-95	286.9	260.9	271.8
15-Jul-95	277.2	256.5	265.9	29-Aug-95	282.1	261.2	271.1
16-Jul-95	279.9	261.4	268.5	30-Aug-95	293.8	261.8	275.4
17-Jul-95	265.9	256.0	260.6	31-Aug-95	291.3	269.0	277.4
18-Jul-95	283.3	254.8	266.7	01-Sep-95	291.3	264.6	271.7
19-Jul-95	307.2	265.4	274.0	02-Sep-95	281.5	260.3	270.7
20-Jul-95	277.7	258.9	266.1	03-Sep-95	283.0	259.8	265.3
21-Jul-95	284.2	260.0	269.0	04-Sep-95	283.6	259.8	267.7
22-Jul-95	288.0	265.2	274.4	05-Sep-95	278.3	261.1	267.0
23-Jul-95	285.7	267.5	274.8	06-Sep-95	267.5	248.2	257.5
24-Jul-95	281.7	261.3	269.1	07-Sep-95	282.5	252.0	263.2
25-Jul-95	287.5	260.5	271.5	08-Sep-95	291.1	265.2	275.8
26-Jul-95	293.6	270.0	278.2	09-Sep-95	295.0	274.2	280.2
27-Jul-95	280.0	258.1	270.6	10-Sep-95	284.0	262.3	273.3
28-Jul-95	280.0	257.3	263.6	11-Sep-95	272.3	252.9	260.1
29-Jul-95	284.1	256.5	265.6	12-Sep-95	266.3	248.0	255.5
30-Jul-95	294.9	262.1	272.4	13-Sep-95	277.6	252.2	261.9
31-Jul-95	296.0	270.1	280.2	14-Sep-95	284.7	261.8	270.2
01-Aug-95	282.0	262.0	270.8	16-Sep-95	290.0	272.8	278.5
02-Aug-95	289.4	266.2	272.4	17-Sep-95	276.2	260.8	268.6
03-Aug-95	289.1	268.8	276.0	18-Sep-95	284.5	260.4	268.2
04-Aug-95	288.6	268.8	276.5	19-Sep-95	280.7	261.9	269.5
05-Aug-95	287.0	262.5	272.9	20-Sep-95	310.0	266.9	274.3
06-Aug-95	296.1	271.6	280.9	21-Sep-95	311.0	276.4	284.5
07-Aug-95	288.3	268.0	276.8	22-Sep-95	286.3	275.1	281.7
08-Aug-95	287.8	264.0	273.1	23-Sep-95	300.4	280.2	286.8
09-Aug-95	288.1	259.3	272.4	24-Sep-95	293.5	284.3	289.7
10-Aug-95	304.3	271.9	284.2	25-Sep-95	295.1	279.1	285.1
11-Aug-95	292.1	269.6	282.1	26-Sep-95	318.8	283.4	298.7
12-Aug-95	275.6	257.5	266.5	27-Sep-95	308.7	288.7	300.4
13-Aug-95	281.0	250.0	261.5	28-Sep-95	292.3	276.6	283.6
14-Aug-95	296.9	259.0	275.0	29-Sep-95	304.1	280.9	290.5
15-Aug-95	290.5	267.7	278.3	30-Sep-95	296.5	261.9	276.1
				01-Oct-95	284.5	258.0	269.2

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TABLE A-3. 4A-2 and 4A-3 (Schober's Resort Wells) Steam Flow.

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
02-Oct-94	1343.2	1296.0	1321.7	16-Nov-94	1479.6	1426.3	1457.2
03-Oct-94	1343.8	1299.9	1324.1	17-Nov-94	1487.6	1426.1	1465.5
04-Oct-94	1372.8	1317.3	1344.2	18-Nov-94	1466.2	1425.8	1449.2
05-Oct-94	1354.6	1324.1	1332.8	19-Nov-94	1471.9	1437.7	1453.0
06-Oct-94	1335.5	1315.9	1328.1	20-Nov-94	1469.1	1436.6	1450.1
07-Oct-94	1349.5	1319.6	1334.9	21-Nov-94	1478.2	1434.6	1453.2
08-Oct-94	1353.5	1323.9	1339.5	22-Nov-94	1636.2	1449.7	1514.9
09-Oct-94	1372.8	1331.8	1350.4	23-Nov-94	1598.0	1542.8	1567.4
10-Oct-94	1368.0	1342.6	1358.3	24-Nov-94	1556.7	1467.9	1511.8
11-Oct-94	1366.6	1341.2	1354.4	25-Nov-94	1489.3	1471.6	1481.2
12-Oct-94	1381.4	1337.5	1364.9	26-Nov-94	1493.3	1470.2	1482.2
13-Oct-94	1393.0	1364.6	1372.4	27-Nov-94	1506.6	1456.5	1481.7
14-Oct-94	1389.6	1364.6	1374.6	28-Nov-94	1489.0	1461.9	1475.4
15-Oct-94	1434.0	1366.6	1389.3	29-Nov-94	1479.9	1465.1	1472.0
16-Oct-94	1429.8	1404.4	1418.2	30-Nov-94	1478.2	1250.4	1368.9
17-Oct-94	1417.2	1395.0	1406.3	01-Dec-94	1280.9	1223.9	1243.5
18-Oct-94	1430.9	1387.9	1411.3	02-Dec-94	1254.4	1223.9	1239.9
19-Oct-94	1452.5	1401.0	1418.3	03-Dec-94	1260.1	1229.0	1241.4
20-Oct-94	1481.3	1425.2	1450.7	04-Dec-94	1255.5	1217.1	1240.1
21-Oct-94	1457.4	1436.6	1443.0	05-Dec-94	1244.4	1225.9	1235.6
22-Oct-94	1439.2	1417.0	1427.9	06-Dec-94	1247.6	1222.5	1235.6
23-Oct-94	1456.8	1416.7	1440.0	07-Dec-94	1241.9	1216.0	1224.2
24-Oct-94	1447.7	1425.5	1438.4	08-Dec-94	1227.1	1200.6	1216.2
25-Oct-94	1442.3	1414.1	1431.2	09-Dec-94	1198.9	1167.8	1181.9
26-Oct-94	1448.8	1418.4	1431.2	10-Dec-94	1207.1	1178.4	1190.1
27-Oct-94	1453.4	1406.4	1424.6	11-Dec-94	1212.3	1177.8	1195.6
28-Oct-94	1434.6	1398.2	1421.7	12-Dec-94	1223.1	1200.0	1213.0
29-Oct-94	1441.7	1413.5	1428.2	13-Dec-94	1223.4	1209.1	1218.3
30-Oct-94	1458.5	1435.5	1446.2	14-Dec-94	1250.4	1211.4	1229.4
31-Oct-94	1448.3	1431.2	1438.8	15-Dec-94	1243.9	1227.6	1235.5
01-Nov-94	1446.6	1422.4	1434.3	16-Dec-94	1243.3	1220.2	1231.4
02-Nov-94	1490.1	1412.1	1437.7	17-Dec-94	1251.3	1195.5	1223.5
03-Nov-94	1496.1	1452.3	1476.0	18-Dec-94	1230.2	1206.8	1218.4
04-Nov-94	1487.8	1445.7	1462.7	19-Dec-94	1239.9	1196.3	1220.6
05-Nov-94	1455.7	1412.7	1439.8	20-Dec-94	1228.8	1200.9	1213.9
06-Nov-94	1442.0	1407.0	1429.7	21-Dec-94	1226.8	1176.7	1200.9
07-Nov-94	1448.6	1435.2	1439.6	22-Dec-94	1222.2	1182.9	1201.6
08-Nov-94	1447.7	1425.2	1437.1	23-Dec-94	1204.6	1189.8	1196.5
09-Nov-94	1454.2	1418.7	1438.0	24-Dec-94	1217.4	1189.5	1199.8
10-Nov-94	1448.8	1409.8	1427.9	25-Dec-94	1222.8	1195.7	1205.1
11-Nov-94	1446.6	1420.7	1433.9	26-Dec-94	1238.2	1201.4	1217.4
12-Nov-94	1446.0	1419.8	1436.5	27-Dec-94	1217.4	1198.6	1205.3
13-Nov-94	1446.3	1420.1	1436.8	28-Dec-94	1204.6	1145.6	1169.9
14-Nov-94	1459.9	1416.7	1435.1	29-Dec-94	1210.5	1143.4	1175.6
15-Nov-94	1451.4	1403.3	1430.2	30-Dec-94	1211.4	1181.2	1198.0

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TABLE A-3. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
31-Dec-94	1206.8	1178.9	1194.1	14-Feb-95	968.0	932.4	944.4
01-Jan-95	1226.2	1192.0	1211.8	15-Feb-95	958.3	922.7	938.5
02-Jan-95	1220.8	1143.6	1191.4	16-Feb-95	930.1	894.5	908.2
03-Jan-95	1158.7	1134.5	1144.3	17-Feb-95	937.5	904.5	917.9
04-Jan-95	1205.7	1130.5	1161.2	18-Feb-95	941.5	918.2	931.6
05-Jan-95	1229.9	1100.4	1194.3	19-Feb-95	957.4	928.7	941.6
06-Jan-95	1177.5	1113.2	1150.9	20-Feb-95	960.0	940.9	951.9
07-Jan-95	1122.0	1096.4	1107.5	21-Feb-95	941.8	919.3	929.4
08-Jan-95	1112.9	1089.5	1105.5	22-Feb-95	937.5	900.2	921.5
09-Jan-95	1160.2	1107.2	1133.1	23-Feb-95	945.5	908.2	924.2
10-Jan-95	1124.6	1089.5	1102.7	24-Feb-95	919.0	898.8	907.1
11-Jan-95	1093.0	1075.6	1086.2	25-Feb-95	925.6	902.8	915.8
12-Jan-95	1101.5	1050.5	1073.0	26-Feb-95	942.4	908.5	933.0
13-Jan-95	1112.3	1051.7	1076.9	27-Feb-95	941.8	912.5	926.1
14-Jan-95	1107.8	1071.0	1093.2	28-Feb-95	930.7	916.7	922.4
15-Jan-95	1103.5	1091.5	1098.7	01-Mar-95	928.1	895.7	911.0
16-Jan-95	1119.2	1093.5	1109.2	02-Mar-95	906.5	889.1	897.4
17-Jan-95	1122.3	1083.6	1107.0	03-Mar-95	909.9	888.0	901.6
18-Jan-95	1093.2	1072.5	1081.8	04-Mar-95	926.1	900.2	913.7
19-Jan-95	1085.3	1036.9	1061.3	05-Mar-95	940.6	917.3	926.6
20-Jan-95	1079.6	1038.3	1053.7	06-Mar-95	945.8	914.5	930.1
21-Jan-95	1073.9	1042.3	1056.6	07-Mar-95	948.9	924.1	934.5
22-Jan-95	1079.6	1055.7	1066.5	08-Mar-95	943.2	918.7	927.5
23-Jan-95	1062.5	1043.1	1054.9	09-Mar-95	930.4	903.6	917.3
24-Jan-95	1061.9	1046.0	1051.8	10-Mar-95	945.8	911.6	922.4
25-Jan-95	1061.4	1041.1	1052.4	11-Mar-95	945.8	926.1	933.6
26-Jan-95	1045.4	1019.2	1035.8	12-Mar-95	959.4	931.0	945.5
27-Jan-95	1081.3	1025.5	1051.8	13-Mar-95	937.8	916.4	928.5
28-Jan-95	1099.8	1065.6	1079.1	14-Mar-95	925.8	907.9	915.2
29-Jan-95	1093.2	1070.8	1082.3	15-Mar-95	917.9	891.4	900.5
30-Jan-95	1081.6	1048.8	1069.8	16-Mar-95	926.1	883.7	904.1
31-Jan-95	1039.4	1019.8	1029.3	17-Mar-95	915.6	884.6	904.4
01-Feb-95	1030.9	984.2	1003.2	18-Mar-95	926.4	899.7	911.1
02-Feb-95	984.2	960.3	973.7	19-Mar-95	936.9	901.9	923.2
03-Feb-95	969.1	908.8	932.4	20-Mar-95	926.1	898.8	910.1
04-Feb-95	931.0	906.2	917.2	21-Mar-95	918.7	905.3	910.5
05-Feb-95	937.2	923.9	929.8	22-Mar-95	902.2	828.8	865.9
06-Feb-95	937.2	905.9	920.3	23-Mar-95	860.4	824.8	839.8
07-Feb-95	913.6	900.5	909.2	24-Mar-95	849.0	824.2	837.9
08-Feb-95	906.2	886.6	897.9	26-Mar-95	866.1	846.1	858.8
09-Feb-95	906.8	878.0	897.2	01-Apr-95	800.0	771.3	788.6
10-Feb-95	896.0	872.3	887.4	02-Apr-95	798.6	767.0	785.6
11-Feb-95	943.2	898.5	914.2	03-Apr-95	815.7	769.0	789.0
12-Feb-95	946.3	915.0	929.9	04-Apr-95	836.2	779.8	806.8
13-Feb-95	962.3	929.3	942.6				

TABLE A-3. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
05-Apr-95	810.3	788.3	800.8	20-May-95	885.2	875.6	879.1
06-Apr-95	861.2	785.5	830.6	21-May-95	890.0	875.6	880.5
07-Apr-95	878.9	849.0	862.8	22-May-95	890.0	878.0	883.8
08-Apr-95	866.6	839.3	848.9	23-May-95	890.0	875.6	883.0
09-Apr-95	860.1	839.9	852.6	24-May-95	884.4	875.6	879.2
10-Apr-95	886.3	809.7	836.2	25-May-95	885.2	870.8	878.0
11-Apr-95	831.3	806.3	818.2	26-May-95	885.2	870.8	877.9
12-Apr-95	836.7	806.0	824.7	27-May-95	885.2	870.8	878.1
13-Apr-95	839.0	822.2	828.1	28-May-95	882.7	868.3	875.8
14-Apr-95	846.4	796.0	818.7	29-May-95	887.2	875.3	878.3
15-Apr-95	831.9	793.2	812.4	30-May-95	891.8	877.5	883.3
16-Apr-95	845.3	817.4	830.1	31-May-95	889.2	877.3	883.4
17-Apr-95	838.4	810.5	825.5	01-Jun-95	891.3	881.8	883.6
18-Apr-95	850.4	814.2	827.5	02-Jun-95	910.3	881.7	893.8
19-Apr-95	839.9	811.4	821.9	03-Jun-95	905.3	891.0	900.2
20-Apr-95	816.8	779.8	802.4	04-Jun-95	902.8	890.7	896.6
21-Apr-95	808.8	782.6	794.1	05-Jun-95	902.4	890.5	896.6
22-Apr-95	801.1	770.1	778.6	06-Jun-95	912.1	892.6	915.6
23-Apr-95	807.1	767.8	789.9	07-Jun-95	933.0	890.0	906.7
24-Apr-95	806.6	776.4	788.2	08-Jun-95	911.4	890.0	901.9
25-Apr-95	789.5	777.5	783.6	09-Jun-95	908.7	896.7	903.4
26-Apr-95	787.8	767.6	773.8	10-Jun-95	903.8	894.1	899.1
27-Apr-95	783.8	765.3	773.2	11-Jun-95	910.7	891.7	900.5
28-Apr-95	771.5	755.3	765.6	12-Jun-95	924.8	898.6	909.3
29-Apr-95	793.7	762.4	778.4	13-Jun-95	924.5	905.5	913.9
30-Apr-95	799.4	766.7	782.6	14-Jun-95	926.1	902.9	913.2
01-May-95	777.2	757.9	764.2	15-Jun-95	917.0	905.0	911.8
02-May-95	768.7	740.2	756.6	16-Jun-95	923.9	905.0	913.0
03-May-95	929.3	733.1	833.3	17-Jun-95	923.7	897.4	909.0
04-May-95	939.2	897.4	912.7	18-Jun-95	909.1	894.9	900.7
05-May-95	937.8	916.3	925.9	19-Jun-95	911.3	897.1	903.0
06-May-95	928.3	913.9	920.9	20-Jun-95	918.2	899.3	906.6
08-May-95	921.1	909.1	915.7	21-Jun-95	913.5	898.9	911.9
09-May-95	913.9	899.6	905.9	22-Jun-95	908.2	889.3	898.8
10-May-95	915.5	875.6	899.6	23-Jun-95	908.0	891.5	899.1
11-May-95	913.9	899.6	904.9	24-Jun-95	900.8	886.5	894.8
12-May-95	930.7	906.7	916.0	25-Jun-95	905.2	891.0	896.5
13-May-95	928.3	913.9	919.8	26-Jun-95	907.4	895.4	901.5
14-May-95	921.1	906.7	916.5	27-Jun-95	904.8	885.8	897.3
15-May-95	906.7	875.6	890.9	28-Jun-95	892.8	888.0	891.4
16-May-95	878.0	870.8	875.1	29-Jun-95	901.1	885.0	892.9
17-May-95	882.8	875.6	878.0	30-Jun-95	928.1	890.7	903.4
18-May-95	885.2	870.8	878.6	01-Jul-95	948.2	920.3	932.9
19-May-95	882.8	875.6	877.6	02-Jul-95	956.4	940.3	947.6
				03-Jul-95	961.9	948.0	952.5

TABLE A-3. (Contd.)

Date	High, lb/h	Low, lb/h	Avg, lb/h	Date	High, lb/h	Low, lb/h	Avg, lb/h
04-Jul-95	965.4	953.8	958.3	18-Aug-95	928.1	914.6	925.3
05-Jul-95	960.1	951.8	956.1	19-Aug-95	928.6	917.4	922.1
06-Jul-95	957.6	946.6	952.9	20-Aug-95	927.0	917.7	921.7
07-Jul-95	954.4	948.9	951.2	21-Aug-95	922.6	909.4	916.2
08-Jul-95	948.9	940.5	946.4	22-Aug-95	914.3	902.7	909.8
09-Jul-95	946.7	939.8	943.9	23-Aug-95	921.5	905.3	912.5
10-Jul-95	949.9	938.3	943.7	24-Aug-95	926.5	912.8	917.8
11-Jul-95	944.7	936.4	942.9	25-Aug-95	919.8	908.5	913.8
12-Jul-95	946.4	928.7	939.3	26-Aug-95	920.5	904.4	913.0
13-Jul-95	939.1	929.9	936.1	27-Aug-95	923.2	907.1	915.1
14-Jul-95	944.3	928.4	934.7	28-Aug-95	923.6	909.8	915.7
15-Jul-95	938.3	927.1	934.2	29-Aug-95	917.2	905.6	913.0
16-Jul-95	936.9	927.1	932.3	30-Aug-95	922.2	901.6	912.6
17-Jul-95	934.0	918.9	925.2	31-Aug-95	922.7	908.8	916.6
18-Jul-95	927.1	918.3	923.4	01-Sep-95	922.3	909.2	919.5
19-Jul-95	932.6	919.2	925.5	02-Sep-95	928.0	916.6	921.7
20-Jul-95	925.3	917.7	923.4	03-Sep-95	926.2	910.2	918.9
21-Jul-95	927.5	916.0	921.8	04-Sep-95	926.6	910.5	919.8
22-Jul-95	928.4	915.4	922.5	05-Sep-95	927.0	913.2	920.9
23-Jul-95	927.0	916.1	922.5	06-Sep-95	920.3	902.2	913.5
24-Jul-95	925.6	916.6	921.4	07-Sep-95	932.4	907.0	916.7
25-Jul-95	924.2	915.1	919.7	08-Sep-95	939.8	914.4	924.7
26-Jul-95	930.0	914.3	923.7	09-Sep-95	933.4	919.5	928.8
27-Jul-95	929.3	919.1	924.2	10-Sep-95	929.2	919.8	926.1
28-Jul-95	924.8	913.4	920.8	11-Sep-95	927.0	915.7	921.2
29-Jul-95	923.3	909.9	917.5	12-Sep-95	923.1	909.2	918.0
30-Jul-95	921.9	910.7	916.4	13-Sep-95	923.6	909.6	918.0
31-Jul-95	920.7	911.9	917.3	14-Sep-95	930.8	914.6	922.0
01-Aug-95	920.0	910.6	914.8	15-Sep-95	931.4	917.4	926.6
02-Aug-95	924.7	911.3	914.8	16-Sep-95	938.6	922.3	929.8
03-Aug-95	919.8	912.7	915.0	17-Sep-95	931.9	915.9	924.5
04-Aug-95	920.2	911.1	915.9	18-Sep-95	928.0	914.0	921.4
05-Aug-95	915.9	904.7	911.9	19-Sep-95	933.0	916.6	923.2
06-Aug-95	918.8	907.3	913.7	20-Sep-95	933.5	921.7	929.6
08-Aug-95	919.7	908.2	915.0	21-Sep-95	949.1	926.3	936.5
09-Aug-95	920.1	906.4	914.5	22-Sep-95	942.0	925.5	935.2
10-Aug-95	927.3	911.2	919.0	23-Sep-95	938.5	927.2	933.7
11-Aug-95	923.2	916.3	920.3	24-Sep-95	938.1	928.6	934.5
12-Aug-95	921.4	910.0	916.0	25-Sep-95	937.3	927.8	934.0
13-Aug-95	917.3	908.0	913.6	26-Sep-95	940.8	929.5	935.4
14-Aug-95	924.5	908.4	916.5	27-Sep-95	948.1	931.1	939.8
15-Aug-95	922.7	911.1	918.9	28-Sep-95	943.7	934.9	938.8
16-Aug-95	925.3	909.3	918.2	29-Sep-95	943.1	935.9	938.8
17-Aug-95	925.8	916.5	920.8	30-Sep-95	940.5	919.6	928.8
				01-Oct-95	930.1	918.9	926.0